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Board of Natural Resources
Colstrip Hearings

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TUESDAY, MARCH 9, 1976

The hearing reconvened at 9:05 A.M. on Tuesday, March 9, 1976, in the Chambers of the Montana House of Representatives, State Capitol, Helena, Montana.

The Honorable Carl M. Davis, Hearings Examiner, presided over the proceedings.

APPEARANCES:

Applicants:

William M. Bellingham, Esq.
John L. Peterson, Esq.

Department of Natural Resources and Conservation:

Arden E. Shenker, Esq.
Ted J. Doney, Esq.
Donald MacIntyre, Esq.

Northern Plains Resource Council:

Leo Graybill, Jr., Esq.

Northern Cheyenne Tribe, Inc.

Peter Michael Meloy, Esq.

The following proceedings were had:

HEARINGS EXAMINER: Very well, we're on the record. We'll proceed with the cross-examination of Dr. Gordon by Mr. Peterson.

CONTINUATION OF EXAMINATION OF DR. C. C. (CLANCY) GORDON

Cross, by Applicants

By Mr. Peterson (continuing):

Q Dr. Gordon, yesterday afternoon we were discussing your histological technique. I now ask you, sir, whether when you as a scientist who evidently developed this technique, would consider the fact that it would help test its validity if it were, in fact, published by you through any scientific journals?

A I think that is true.

Q And have you prepared for publication yourself the technique specifying all of the species which you have examined, and the detail relative to the particular gases?

A Not in a published form; however, on numerous occasions, under deposition, and therefore under oath, I have elaborated for two days, for three days, on the techniques that we utilized in our histological studies, for lawyers who were working for power companies and aluminum companies. These techniques are all down and available to the scientists who are also there during these depositions. The techniques have been tried by other scientists and have been published in total by Mike Treshow in his study on histological work in the Canadian Journal of Botany, so I don't think there's any secret as to anything I'm doing.

Q I don't think there's a secret either,but my question is whether or not you put it in any recognized scientific journal for the purpose of having it pass through an editorial board or something of that nature.

A I personally have not.

Q To the best of your knowledge, what would you say the typical depth of water absorbing roots in soil is for grasses and Ponderosa pine?

A Are you talking about the grasses or the Ponderosa pine?

Q Let's take one at a time.

A The Ponderosa pine, probably somewhere in the neighborhood of 20 to 30 feet; however, this depends upon its location. If it's along the knolls, it will be much deeper than if it's down on the flatland or up on the flatland. The grasses, according to Mel Morris's work, I would say it's in the neighborhood of about 24 to 40 inches on some grasses; some grasses, much shallower, especially the annuals.

Q Relative to the Ponderosa pine depth, is that the depth to which the roots go for their primary water absorption?

A No, they have two types of roots. They have a taproot and then they have lateral roots, which fan out and are usually out about 4 to 8 feet beyond the canopy itself, and if you think about it, the canopy of the Ponderosa pine, when you think of 4 to 8 feet beyond that, would be the lateral roots.

Q What would be the depth of the root?

A The taproot?

Q Yes.

A As far as 20 feet.

Q And how about the lateral?

A Well, let's say the canopy covers 14 feet. Then you can add 4 to 8 feet on each side of that, so you can see you're out there around 24 feet.

Q How far down do the laterals go?

A From the laterals, there are secondary or tertiary laterals from those, which in turn go down, but they do not go down as deep as the main tap.

Q Do you know how far?

A I would say that they're probably in the neighborhood of about 6 to 8 feet.

Q Are there lateral roots associated with grasses as well as with pine?

A Yes, there are.

Q What would be their depth?

A It depends. If you have the rhizomous grasses, then you would have lateral roots from those rhizomes going down a foot, two feet.

Q What kind of grasses were those?

A Rhizomes, those with rhizomes.

Q What about non-rhizomous grasses?

A Then you'd have something like the bunchgrass, and you would not have quite the lateral root formation as you have with the rhizomous grasses, but you have deep penetration. These would be something like your Western wheatgrass or your Ag spic.

Q Are the lateral roots primary in absorbing water, or the taproot?

A They both are.

Q Do you know which one is the most active?

A It depends on what time of year you're talking about.

Q Give me an example.

A As long as the water is available and there is abundant water, those laterals take up an abundant amount of water. The taproot takes up water all the time, but when that water becomes less, this is also during the slowdown of the growth of the tree. The tree starts to slow down its growth in about July, the end of July, when the water becomes less in the soils, and the taproot brings in most of the water at this time.

Q What about the bunchgrasses?

A I thought you were talking about Ponderosa pine. Sorry.

Q What about bunchgrass?

A What about them?

Q What is the primary water absorption for the lateral, as opposed to the mainroot? Is there such a thing?

A I don't know. I'd have to ask Mel Morris.

Q Who is Mel Morris?

A He is probably the most knowledgeable person on the grasslands of the Fort Union Basin in the United States today. He's a former professor, professor emeritus at the University of Montana.

Q Do you know what the depth of the lateral roots would be for bunchgrasses?

A It will vary.

Q Dependent on the time of the year?

A It will depend on the species.

Q Without specifying the species, is there a range you could indicate?

A I could look it up in Mel's article if you'd like me to.

Q Okay.

(PAUSE TO COMPLY.)

A Sand reedgrass, down to about 35 inches; Little Bluestem, 30 to 34 inches, Idaho fescue, 15 to 16 inches; Needle and thread, approximately the same, 16 inches; Green-needle grass, down to 24 inches, Bluebunch Wheat Grass, about 12 inches.

Q Are those lateral roots?

A He has not distinguished between laterals here. They're just roots.

Q Does he give any indication as to the depth of the lateral roots?

A In the Bunchgrasses, the roots are primarily beneath the bunch itself. It doesn't fan out too much in the Bunchgrasses.

Q But you would classify them as lateral roots, though, those that are just beneath the bunch?

A Some of the roots. If you understand what roots are, all roots put out lateral roots.

Q You don't know the depth of the lateral roots?

A Not in all cases, no.

Q Is there any reference to which you could refer to give us testimony as to any case where there would be an indication as to the depth of the lateral roots for Bunchgrass?

A There was a student who never finished his PhD, who worked for the DNR -- his name was Fisher, and I was on his committee. He worked with Mel Morris, Dr. Behan, and myself. He worked on the grasses of the Fort Union Basin between 1967 and 1966 until about 1969, at which time he left without receiving his PhD. His studies dealt with the root systems of the grasses of the Fort Union Basin. I have some of that data. I don't remember quite where it is, but I'm sure I could find it.

Q You agree that the average precipitation in the Colstrip area is about 14 inches a year?

A That is correct. There are exceptions, primarily on the Northern Cheyenne Reservation.

Q And they are lower?

A They are greater.

Q How much?

A Probably two to four inches greater.

Q How often do they occur statistically? Have you any historical data?

A I have looked at some of the data, but not much. That data is available from Keith Beartusk, who is the head BIA forest ranger for the Northern Cheyennes.

Q Is Lame Deer on the reservation?

A Yes, it is.

Q Would that data be representative of what the reservation would get?

A No, it would not. Lame Deer is down in the valley and the top of those mountainous peaks is where the rain catches.

Q Is it true, also, that about 57% of the precipitation falls in a 5-months period from March to July?

A That is correct.

Q Are there any exceptions to that that you know of from the historical data?

A There are exceptions to that. You can have a wet summer all the way through and you can have an extremely dry summer where there's no rain even during that five months period.

Q On the basis of the historical data, have you determined how often that occurs?

A I think it's a 50-year cycle on that as far as the drought is concerned.

Q How much of the 57% would fall within the months of May and June?

A I'd have to look it up. It's probably in the neighborhood of around 15 to 25 percent.

Q 15 to 25 percent of what figure?

A Of the 57% that falls between the 5-months period.

Q So we've got 57% during the 5-months period and 15 to 25 percent for the two months, May and June, during that 5-months period?

A Right.

Q What was the source of that information?

A The data from Mel's studies, the data from the Grassland Biome studies, studies that range back to about 1924, studies on the grassland biomes of the Fort Union Basin.

Q That's a published work?

A These are all published works.

Q Do you feel, Dr. Gordon, that because of ingestion, a significant amount of fluoride would be transferred through the food chain of carnivorous animals?

A I don't know how you set the basis for that question, and I'd hate to have to go back to the whole story. Are you going to stop at the top of the food chain here?

Q Just go ahead and give me your general answer to the general question.

A I would say, from the data that we have collected, since we do not kill predators, it's very limited. Of the predators that we have studied on fluoride accumulation in areas that are polluted with fluoride, we have not found high incidence of fluorides -- and I mean by high incidence, not above 3,000 parts per million in any of the predators we have taken.

Q Does that indicate to you therefore, that there is no transfer through the food chain?

A Absolutely not.

Q What evidence do you have that there is?

A I would say the evidence is biological evidence in the sense of DDT or any other chemical which is reactive, such as DDT or DDE and so on.

Q Have there been any studies done that show there may be a transfer through the food chain?

A Of what?

Q Of fluorides through carnivorous animals.

A The only studies that have been done, I think, on carnivorous animals,are the few reports,the few analyses that we have done. No one has carried out this type of studies.

Q But they indicate just the opposite to your opinion, don't they?

A They don't indicate anything. Like I said, we have not killed predators to do these studies.

Q What is the basis, then, of your opinion that there could be a transfer?

A The basis of my opinion is based upon other chemicals, other compounds that man releases into the environment, which in turn increase as they go up the food chain.

Q Is that by ingestion?

A In some cases, yes.

Q Dr. Gordon, in part of your testimony, you have discussed the so-called ZAP plots, and I believe that you have mentioned that they were fumigated with SO_2 at specific concentrations?

A That is correct.

Q Did you participate in the selection of the concentrations?

A Yes, I argued on the concentrations.

Q Were there differences of opinion as to what the concentrations should be?

A Yes, there was.

Q What was the other theory?

A Besides mine, you mean?

Q Yes.

A The theory was, No. 1, we would like to see an effect, EPA. No. 2, we would like to see an effect at the state annual standard for SO_2 -- that was their argument. My argument was just the opposite. I would like not to worry about standards. I would like to see where you do not have an effect.

Q At what level, at the concentration?

A That is correct.

Q Who began, or who worked on the ZAP plot?

A In my testimony, I talk about the four groups who have worked on the ZAP plot. They are the group out of Bozeman, Jack Taylor and Sharon Eversman, from Bozeman. From Colorado State University, it was Jerry Dodd and Bill Lauenroth. From NERL, it is Bob Lewis and Eric Preston, the EPA-NERL Lab, Corvallis, Oregon, and from the University of Montana, our group.

Q You selected four one-acre plots in and about the Colstrip area, is that correct?

A They are, I believe, some miles from Colstrip, but they are within the impact area of Colstrip, yes.

Q How far are they from the plant site?

A I think they are somewhere in the neighborhood of 60 miles.

Q And the basic ecosystem was dominated by Western wheatgrass?

A That is correct.

Q What other forbs, scrubs or grass were contained in the plots?

A Numerous ones.

Q What was the second most dominant species?

A Probably Stipa comata, Artemesia Tridentata, Artemesia cana -- I forget.

Q Is there any Indian ricegrass?

A I don't believe there's any Indian ricegrass there.

Q Did anyone from the study group take a survey of the grasses?

A Yes, these plots are totally analyzed as far as all of the species upon them, and how dense each species is on them. I have that data; I just can't remember all of it.

Q Would you supply that data to us, because it isn't included in one of your exhibits?

A Again these are very long reports, and I imagine you will pay for the xeroxing?

Q Yes, sir, I will. How many continuous sensors were used on each plot?

A There were four to two -- two to four, I should say -- on each plot. There were four intakes on two of the plots, three, I think, on one of the plots, two on the control plot.

Q Could you identify by plot the sensors that were placed on each plot?

A Can I identify where they're at?

Q Yes.

A Yes, I believe I can.

Q They would be shown on Exhibit 227, I assume?

A That is correct.

Q All right, for the plot which was fumigated at the concentration, 10 parts per hundred million, where were the sensors located?

A If you look at the grid system there, what you're looking at are actually the pipes over the damaged vegetation there, and the sensors here were four. They were not beneath the pipes; they were directly in the middle of any given grid. Let me draw that on the board for you.

(WITNESS MAKES DRAWING ON BOARD.)

A What you're looking at here are the aluminum pipes. This would be the main pipe. Of course, they're all connected together here, the delivery system. It would be like that across the plot (indicating).

Q Were those four dots included in each plot?

A No.

Q There were two in other plots?

A In the control plot, there were only two.

Q And four in the concentrated 10 parts per hundred million?

A Yes.

Q How many were there in the plot that concentrated the five parts per hundred million?

A I think in both the two parts per hundred million, five parts per hundred million, and the ten parts per hundred million, there were four sensors in each one of those.

Q What kind of sensors were they? You make the notation here on page 20 of your statement that there were two to four dynamic monitoring stations. I assume those are the sensors?

A Yes. I believe they were Phillips SO_2 Analyzers, and I will check on that.

Q How were the pipes perforated at regular intervals?

A They were drilled.

Q How far apart were the perforations?

A I have that data down. I think it's a foot to 16 inches. I would have to check on that.

Q And the pipes were located how high above the ground level?

A I believe they were 24 inches, above the ground level.

Q How large were the perforated holes?

A They were with a sixteenth-inch drill, I believe. Again, I would have to check on that.

Q What was the source of the SO_2?

A Bottled.

Q Was it then pumped directly into the pipes?

A That is correct.

Q Was there any type of a mixing system used?

A Yes.

Q What type?

A I don't know. I don't know what type of blender they used. I could find that out.

Q Was there a mixing chamber?

A Yes.

Q Did it have a baffle situation?

A I don't know. I would have to look the engineering up. I just didn't pay much attention to it.

Q Who set the engineering?

A EPA.

Q Do you know who associated with the group?

A They're qualified engineers. I do not know.

Q Why would you need a mixing chamber in order to conduct the experiment?

A So they could get the right combination. They didn't use bottled air, by the way, they just took air, I believe. They had pumps for the air mixture.

Q Do you know why they would mix the air with the SO_2?

A Sure, to get the right concentration.

Q Going through the pipes or exiting out of the hole?

A The exiting through the hole was taken care of by the monitors which in turn, they could regulate the mixture.

Q Have you ever seen the monitor, the Phillips Analyzer, working down there?

A Yes.

Q How would it control the mixture, that is, the concentration coming out of the pipe?

A It would not. It was done manually by the man who ran that.

Q Would he then check with the analyzer to determine the concentration?

A Yes. Once he got going, he knew the ranges he had to work and so on, and he would watch it rather carefully.

Q Was this on a 24-hour basis?

A Yes, when it was first started, it was pretty much on a 24-hour basis.

Q Were they watching the monitors? Did they have somebody in attendance at those plots all the time?

A Not all the time, no.

Q How do you know that the concentrations, then, were, in fact, at the levels at which they were set?

A They were not always at the levels that they set. They would vary some.

Q How much would they vary? What percentage of the time?

A I would have to look at the data. Most of that data is not out, because EPA has not put it through their computers. I can tell you this, that the median concentrations on all of the plots was below the desired delivery rate that EPA wanted.

Q How far below?

A The two parts per hundred million, I believe the median was 1.6 parts per hundred million.

Q What about the five parts per hundred million?

A I believe it was between four and five.

Q And the ten parts per hundred million?

A Between eight and nine.

Q Was that determined strictly from the basis of the data collected in the analyzer?

A That is by the readouts, right. It was all automated as far as the readouts were concerned.

Q How often were the readouts taken?

A Ten minutes and half hours.

Q They're punched on a data card?

A They had a graph and data cards.

Q Why would the measured concentrations from the analyzer be less than that set at the control spot?

A These were median concentrations.

Q Why would the median come out less than what was desired?

A Because anything that man builds has a lot of fluctuation in it.

Q Would it have anything to do with the weather conditions?

A Definitely it would have to do with them, because you get the winds coming up. A ground wind would push the SO_2 off of the plots very rapidly.

Q Were the winds also calibrated on a 10-minute basis?

A That I do not know.

Q What kind of meteorology data was taken at the time the experiment was being conducted?

A Humidity, temperature --

Q When you say temperature, you mean ambient temperature?

A Ambient temperature.

Q Any soil temperatures?

A Soil temperatures, I believe, were taken also.

Q Any moisture gradings?

A Moisture gradings and soils, yes.

Q Were there any measurements for nutrient content?

A Yes.

Q What type of soil moisture tests was taken? Was that for available moisture, total moisture, or what?

A I believe it was for available moisture, but I would have to check that.

Q Who has all this data?

A That is done by Jerry Dodd and his group in Colorado.

Q And it has not been put into final form?

A He wrote a progress report, which was submitted in December, and we had a meeting in Corvallis, Oregon the 1st of January. He talked about this, but this is summarized data. Much of Jerry Dodd's data is not out yet from last summer's ZAP plot.

Q Was there any data taken to indicate what the SO_2 concentrations were, upwind or downwind, at a specific plot, at a specific windspeed?

A If you are asking me if there were monitoring systems off of the plots, beneath the aluminum pipes, the delivery systems, there was not.

Q There was, however, a monitoring system on the control plot?

A There were monitoring systems on the control plot.

Q And what was the median of the control plot as far as concentrations were concerned?

A Below the readable level.

Q Do you know what the sensitivity is of the Phillips Analyzer?

A I believe it's either .005 parts per million or .01 parts per million.

Q One of those two numbers?

A Right. I think it is the former, however, .005.

Q Was there a reason that this particular site was selected?

A Yes.

Q What is that?

A We were thrown off of our other site.

Q That's a pretty good reason. That's a very scientific one, isn't it?

A That site also was picked for the Western wheatgrass, and it was picked by the grassland biome people.

Q Where was the first site?

A Up on top of Ash Creek.

Q Where is that?

A It would be back up the road towards Howe Ranger Station by about four or five miles.

Q What was the reason for your exit from that site?

A It was a bad relationship between the farmer and the rancher who owned that land and the people doing ZAP work.

Q Were there any standard weather bureau instrument shelters used at or about this site?

A Yes.

Q Where were they located?

A I believe they were right at the monitoring station. If you look down at that picture, Exhibit 227, you will see three buildings, four buildings, at the base of each one of the sites.

Q That's a white spot?

A Right.

Q What is the dark spot, the black dot?

A It's probably -- I don't know. It's either the roof of the shelter or the place where the gases were kept.

Q Was there any data taken as to the area of the drift of the SO_2 out of the plot to the north?

A Yes, in a sense, indirect evidence, and I have that in another photograph, which is the same picture you're looking at in Exhibit 227, and this is a density slicer, a colored photo density slicer, which shows the drift from the plots, as well as the fact that there was no drift upon the control plot.

Q What type of camera was used to take the photograph which we have as Exhibit 227?

A Would you repeat the question?

Q What type of camera?

A I don't remember.

Q Do you know anything about the details relative to the taking of the photographs?

A I have it all written down. My photographer has all of that data. I do not have that data. I could get it for you very easily.

Q Was Jack Taylor the one who took the photographs?

A No, this was a NASA pilot, but Jack Taylor is the one who did the density slicer work.

Q Which member of the control group is interpreting the photographs?

A We all are interpreting them.

Q All of you?

A Sure.

Q Was there any injury to the control plot from the dosage concentrations over this -- what was it, a 4-months period?

A A 4-months period.

Q Was there any damage to the control plot?

A No. There was no measurable damage to any of the plots.

Q Is that the reason that you stated in your testimony that there was no loss of the biomass that they could measure?

A And I gave the reasons for that.

Q Those are your own personal reasons?

A No, no, those are reasons that are quite true for most areas when you fumigate for the first time, at low concentrations.

Q Have these reasons been accepted by the other members of the group?

A Yes.

Q Do you distinguish, Dr. Gordon, when we're talking about the effects of air pollution, between injury and damage?

A Do I?

Q Yes.

A I have entered into debates on that subject.

Q Have you taken both sides or just one side?

A I take both sides.

Q Which side are you taking today?

A It really doesn't make any difference because of the fact that I believe that injury which people claim means that there is no determinable loss to that particular plot or species being fumigated, whereas damage means that there is actually some type of economic loss. I refuse to accept as a biologist the concept that you must have economic loss to have destruction of an ecosystem.

Q Well, even under your definition of injury or damage, on these control plots, there was no damage whatsoever?

A There was no measurable damage. That means there was no damage greater than 30 to 40 percent.

Q Why would that occur?

A Because of the techniques used last year. It's a fact that the methodology that's used by the Grassland Biome people until this year was not able to distinguish between -- they could not distinguish loss up to 30% in the Western wheatgrasses.

That means that the farmers in the area could lose 30% of their holding capacity upon that rangeland in the Fort Union Basin and the Grassland Biome people could not detect it.

Q Were the biomass estimates made by this group based upon only the photographs?

A I'm sorry --

Q Were the biomass estimates as to loss or damage obtained, based upon the photographs?

A Absolutely not.

Q Was it done on the basis of taking the samples from the plots?

A That is absolutely correct.

Q And measuring that?

A Absolutely.

Q And what was the difference between the 4-months period of the measurements?

A Four months period and the measurements?

Q Well, I assume that they took a biomass sample at the beginning of the concentrations being applied, did they not?

A That is correct.

Q And I assume they took samples as the concentrations were being applied over the 4-months period?

A That is correct.

Q And I assume they took some samples at the end of the experiment?

A That is correct.

Q Do you have the data as to the biomass count for each one of those periods?

A Yes.

Q And that biomass count shows that there was no loss from the beginning to the end, does it not?

A There was an increase because of the fact that as you go through the phenology of the grasses and the vegetation there, they grow, and therefore, you'll have an increase in the biomass.

Q So now you're going to change the period of time in which you're going to fumigate the area?

A That is correct.

Q And that time is going to be what?

A It will start on April 1st and go until, I believe, August.

Q And what will we expect to find at the end of this experiment?

A I expect to find it before the beginning of the experiment, and that is, I don't think there will be a greenup, extensive greenup on those plots.

Q And who is going to make that determination?

A All three groups.

Q And what will happen at the end of the concentration being applied for the second time?

A The same concentrations as last year.

Q What will be the result as far as the biomass is concerned?

A There will be a loss. I predict a loss.

Q How much of a loss?

A It could be a total loss.

Q In all four plots?

A Not the control plots, sir.

Q In the other three plots that are being fumigated?

A Right. As I said, the concentrations are way too high. I told them that when they started.

Q During the time of the experiment, you testified that the vegetation was clipped or mowed, or whatever, in order to take the samples, is that right? How do you do that?

A How do they do it?

Q Yes, how do they do it?

A They clip, they also take roots, they take soil around the roots, and they do it in little quadrads throughout the plots and I think at any given collection time, they do three plots per collection time. I believe they collected once a month or twice a month. I forget, I'd have to look at the data.

Q Where were the collections taken from?

A Right on the plots.

Q Where in the plot?

A Not beneath the pipes, but between the pipes.

Q Was there a specific distance that was set out as being between the pipes?

A Yes. They have their own formulas and models and so on, and they do it the same way they would do it if it was for overgrazing or anything else.

Q Your testimony is that none of the samples were taken directly underneath the pipe?

A That is correct.

Q Were there samples taken which analyzed the sulfur content of the plants?

A Yes, that's what you see in Exhibits 228 and 229.

Q And where were those samples taken?

A These samples were taken from between the pipes, not beneath the pipes.

Q How far off -- was it equal distance between the pipes?

A I have a map of those, but I do not have it here. I'm sorry.

Q Was there any other member of the control group that took samples and then measured the sulfur content?

A That is correct. That was Jerry Dodd and his group from Colorado.

Q And is the data that you have here, his data?

A This is our data. He is now going to send us his samples so that we can analyze them.

Q Did you take any samples for fluorides?

A Yes, we did.

Q Any other gases?

A No. Those are the only two gases that accumulate in vegetation.

Q Why would you take a fluoride sample if you were only fumigating for SO_2?

A Because I wanted to see if it would decrease the amount of baseline level fluorides or increase it.

Q And what happened?

A It stayed the same.

Q What were the fluoride contents of the grasses?

A Two parts per million.

Q And that's within the normal range?

A That is correct.

Q What was the sulfur in the grasses before the experiment began?

A It says on Exhibit 228 and 229. You can see the black bars are the controls.

Q Are those within normal limits?

A For those particular species, yes.

Q I notice that you've only compared two species between June 28, 1975 and September 28, 1975.

A I don't understand that question.

Q Well, as I read the bar graphs, the only two comparisons that we could make between the 4-months period have to do with Western wheatgrass and Japanese bromegrass, is that right?

A That is incorrect; you're on the wrong exhibit, sir.

Q 228?

A 228 covers Bromus japonicus, Ag-Smithii, Millefolium, Pratensis and Koeleria Cristata.

Q Where are the Millefoliums, the Pratensis, and the Cristata on Exhibit No. 229?

A They are not.

Q Then what two grasses are compared between the beginning of the experiment and the end?

A I would have to check.

Q Why don't you do that?

(PAUSE TO COMPLY.)

A That is correct.

Q Were the sulfur contents of these grasses on June 28, 1975, taken before any concentrations were applied?

A 6/28/75?

Q Yes.

A One month, 30 days.

Q Were there any sulfur contents measured or analyzed before the experiment began?

A From those plots?

Q From those plots.

A Not from those particular plots. All these species have been taken elsewhere in the Fort Union Basin.

Q In other words, you didn't get any baseline data from these particular plots before the fumigation began?

A We utilized the control plot.

Q You would admit, would you not, Dr. Gordon, that a certain amount of cross-fumigation had to take place in this area between the plots?

A That is correct; not on the control, however.

Q Pardon me?

A Not on the control plot.

Q It's your testimony here today that there was absolutely no damage or injury to the control plot from this cross-fumigation from the other plots?

A I will say that there was no cross-fumigation because it does not show in the vegetation as sulfur accumulation in the control plot.

Q Can you determine at all in examining Exhibit No. 227, the aerial photograph, whether or not there was any SO_2 damage because of the cross-fumigation?

A None to the control plot -- not with that particular photograph, but I can with the density slicer color photo.

Q And where is that photograph?

A Right here.

Q On this particular photograph, what is the green portion -- more or less, the darker red?

A The darker red?

Q Yes.

A Or the yellow?

Q Is that what it is, yellow?

A Yes. That is the impact area. It shows the drift of the sulfur dioxide off of the fumigation plots in comparison to the other density reading of the primarily Western wheatgrass area there.

Q What was the general area in acres as to how far the fumigation took place off of the plots?

A You can see it a little better if you go back to 227. You can see the drift goes up over the top of the ridge down the other side.

Q Would that also be true of the upper extreme left side of that photograph? Does that show fumigation damage, right opposite the road?

A No, it does not.

Q What is the difference between the other side of the mountain and that particular portion?

A I talked to Dr. Taylor about this. He thinks it could possibly be a moisture stress.

Q Isn't it a fact that they apparently are about the same characteristics?

A That is why we used the density slicer color-coated, to show the truth of the picture that you're looking at here in Exhibit No. 227.

Q What does that density slicer show as far as that area is concerned?

A It doesn't take it over that far. This is just a portion of this picture here in 227.

Q Was there any damage south of the plot, to the bottom of the photograph on 227?

A No.

Q Was there any damage to the right side of the fumigated plot?

A You mean to the -- ?

Q That would be going to the right side of the photograph 227.

A Okay, that's east -- not that I remember, no.

Q There are some white areas in the Exhibit No. 227 north of the plot which was fumigated at 10 parts per hundred million. Can you identify what buildings those are?

A Buildings?

Q Whatever they are, white spots.

A Within the 25-acre plot, you're talking about?

Q It's just directly east of --

A The ten parts per hundred million?

Q Yes.

A I believe those are extra quadra flip-plots that Dodd and his group took. I would have to check on that, though.

Q Were there any biomass counts taken on the areas outside of the control plots?

A All over the Fort Union Basin.

Q And how about in the areas which are shown to be fumigated north of the fumigated plots?

A That's one question I asked Dodd in Corvallis in January, if he took up over the top of that slope, and I believe he said no. In fact, I'm sure he did.

Q Are there any Ponderosa pine in the area?

A Yes, there are, but not on the plots.

Q Are there any on that ridge going up to the north side?

A No, there's not.

Q You don't happen to have an extra copy of this photograph?

A I will put that into evidence, if you'd like. I'll sell you a copy, if you'd like.

Q How much are they this week?

A I will give you one, Jack.

Q I want to put it in my office.

A Okay.

Q Was there a vegetation map or plot prepared prior to fumigating the area showing the species, the various species, and their locations?

A I don't believe their locations, but they would have had the species that are there and the density of those species on that particular plot prior to the fumigation.

Q Do I understand that none of the particular plots were fenced?

A The entire area is fenced, but not any given plot.

Q What was the altitude difference between the lowest and the highest plot?

A Probably 20 feet.

Q What is the altitude difference between the plots and the top of the ridge to the north of the plot?

A Probably 50 to a hundred feet.

Q How many times did you visit the site of the plots at the time that it was being fumigated?

A Myself, personally?

Q Yes, sir.

A Two or three times.

Q Who was the individual in charge of calibrating the monitor?

A I could find his name. He is a former EPA engineer, now a rancher in the area, I believe.

Q Was he the only individual who ever calibrated the instruments?

A No, there were people who would come in, who were also specialists like him, to discuss that.

Q I believe you have made note of the fact that this was, quote, an absolutely unique study, unquote?

A That is correct.

Q It had never been tried before?

A That is correct.

Q Nor were the mechanics ever tried before?

A I think that is also correct.

Q You state in here that there were some interruptions which took place. How many?

A The interruptions were after a serious argument if the plots had to continue to be fumigated when the men were out cutting the vegetation.

Q Who won that argument?

A The people who were out cutting the vegetation.

Q What would you say, that the interruptions took place almost on a daily basis?

A No.

Q How often would they cut?

A Once it was decided to turn it off, then everyone had to be there to work during that period of time. It might be up to a time as much as six, eight hours.

Q Over what time span in the 4-months period?

A Either twice a month -- usually twice a month, and there were also, of course, interruptions during the time of delivery when they were having problems with the gas delivery system, which was not often, by any means, but it did occur.

Q How often did that occur, Dr. Gordon?

A I would have to see the printouts on those.

Q Do you know of any instance when any of the fumigated plots was receiving a higher fumigation and had to be adjusted downward?

A Yes.

Q And how many times did that occur?

A I do not know that.

Q It was on more than one occasion, wasn't it?

A Yes, it was.

Q Could you give us an estimate, Dr. Gordon, as to what the data might have shown as to that?

A They haven't separated out the 10-minute readings from the half-hour readings. I don't think there was anything longer than a half-hour reading. As I said, the median was below those numbers you have like 2 parts, 5 parts, 10 parts per hundred million. That means that there was an equal amount of number above that as there was below that.

Q Does the data also show what the highest concentration was?

A Yes, it does.

Q And as to the ten parts per hundred million, what was the highest concentration?

A I cannot remember.

Q Would it have doubled?

A I believe it has, yes.

Q How about the five parts per hundred million?

A It would have doubled that, yes.

Q And also the two parts per hundred million?

A That is correct.

Q Who is the gentleman in charge of the data with regard to the fumigation?

A Dr. Al LeFohn.

Q Do you have any of that data in your possession?

A I asked for this data. First, the people who had the data were Dodd and Lauenroth. They had put it into their computer and I asked for the card, the computer card, so that we could put it through ours and get the readings off. At that time, Dr. LeFohn called me and said they had calculated their data incorrectly, we were going to have to redo all of the data, so we did not put the cards through our computer. Dr. LeFohn is now in the process of reprogramming the data for his computer in Corvallis, Oregon.

Q In your testimony, Dr. Gordon, you state at page 17, line 19, you state that the plants will run within the standards, that is, the Colstrip plants, 1 through 4, will run within the standards, operate within the standards, quote, a majority of the time, unquote.

A That is correct.

Q What if we meet the standards all of the time?

A It will not make any difference.

Q What do you term as the majority of the time, what estimate is that?

A The majority of the time?

Q Yes.

A 75 to 85 percent of the time.

Q Did you find whether or not any standards were violated by the refineries in the Billings area at the time you were making the fluoride study?

A Yes.

Q The standards were, in fact, being violated?

A Are you saying that the refineries are violating the state standards and not the Corette plant?

Q I'm asking it about refineries on fluorides.

Q I have talked to the Air Pollution Control Officer of the Exxon Refinery. He claims that he's putting out ten pounds of fluoride per day.

Q What is that in relation to the standards for fluoride?

A If he put out ten pounds?

Q Yes.

A He would not be exceeding the standard, the ambient air standard.

Q Was there any finding by you that the foliage standard had been violated?

A Yes.

Q With regard to the Anaconda Aluminum Plant, it's a fact, is it not, that that plant was emitting about 1370 tons of fluoride a year before the standards were enacted?

A How many did you say?

Q 1370.

A You're talking about tons now?

Q Yes.

A 7500 pounds a day -- I believe that in 1968, when Pot Line 4 and 5 went on line, that that is a possibility, that they were at 7500 pounds a day.

Q You so told the Board of Health that when they were debating the setting of the fluoride standards and the SO_2 standards in Montana, didn't you?

A Could have been.

Q And at that time, you stated that that was why you supported the standard of one part per billion because it would reduce it down to 175 tons of fluoride a year?

A Down to what?

Q 175 tons of fluoride a year.

A That testimony was given when, sir?

A I would say right around 1968-1969.

HEARINGS EXAMINER: Did you say tons of fluoride or chloride?

MR. PETERSON: Fluoride.

A I can never really remember supporting one part per billion in the ambient air. It was just tonnage. I could have said that, yes.

Q That was not really support, that was just --

A It was not support for the one part per billion, no, sir. I do not believe I have ever supported the one part per billion.

Q As a matter of fact, I think it's your position that the fluoride standard should be set at 1/10th part per billion?

A That is correct.

Q And you believe that the SO_2 standard in Montana should be what?

A It should be better than Colorado's 1980, which is .005 parts per million.

Q And even then we're going to have damage?

A I think we will always have damage with those gases which accumulate in vegetation.

Q And you relate the damage, injury and effect as one and the same?

A No, I said I do not accept the terminology, and I said this before, Mr. Peterson, I do not accept the fact that you have to have an economic loss to have damage to an ecosystem.

Q When you were doing work as a private consultant for the landowners along -- around the Cominco American plant, did you find that Cominco American was violating the fluoride standard?

A They were not violating the ambient air standards for fluoride because they were delivering particulate fluorides in non-soluble form to that ecosystem. They were violating the state standard at 35 parts per million in vegetation.

Q Did you find, when you were doing work for the landowners -- or I guess maybe it was even for the Department of Health -- on the Garrison Rocky Mountain Phosphate Plant that those standards, the ambient air standard on fluoride, was, in fact, violated?

A It was violated.

Q Were there violations also occurring at the ASARCO plant at

East Helena when you were doing the work there?

A Yes.

Q With regard to the comment, Dr. Gordon, that you make on page 35 of your statement, you are discussing there, the Mount Storm issue, and you --

A What line, sir?

Q Beginning at 4 and running through the next couple of pages, and you mention that Dr. Wood and Dr. Pennypacker and Dr. Baker -- you state that Dr. Wood and Pennypacker obtained an abnormal disease sydrome on Scotch and white pines in their experiments by cheating and lying.

A That is correct.

Q Do you believe that today?

A Yes, I do.

Q And that is your public statement today?

A It has been my public statement in the past, and it is today.

Q Was there a report furnished by Wood and Pennypacker on their findings of the Mount Storm plant which they presented to the same air pollution control association in Boston in June, when you presented your report?

A Yes, there was.

Q I'm handing you what has been marked as Applicants' Exhibit No. 241. Do you recognize that as the report they made at that convention?

A That is correct.

MR. PETERSON: We'll offer Applicants' Exhibit No. 241.

MR. SHENKER: What's the purpose of the offer? As

As I understand it, Exhibit 241 is a report prepared by somebody who doesn't agree with Dr. Gordon, who evidently isn't going to come here to testify.

MR. PETERSON: As I understand it, the new rules, you don't have to be here to testify if you're not the author. I believe our objection on that was overruled, specifically when Mr. Shenker put in reports from people that weren't authors, and what I've done with Dr. Gordon is have him identify an exhibit that he recognized as a report given at a conference which he attended on the Mount Storm study, which he has discussed in his testimony at page 35.

MR. SHENKER: I think that's a neat but fraudulent trick. Drs. Wood and Pennypacker have prepared a report which Dr. Gordon has specifically said is not valid. Now, in order to put in evidence a document which the witness has identified and described as invalid, seems to me is the exact diametric opposite from putting in evidence a report which an expert witness has described, qualified and designated as a valid report. That, I take it, is the purpose for the offer, that someone says it's a piece of information that's worth looking at. Now, Mr. Peterson is on cross-examination at this point. The offers that we previously made were on our direct or redirect examination of witnesses who were here to be examined on their views with respect to the validity of the documents which they offered in evidence. If Dr. Gordon is here and supposedly to be cross-examined on the invalidity of a document which he does not accept, we have then neatly retreated backward through the looking glass.

MR. GRAYBILL: May I be heard?

HEARINGS EXAMINER: Yes, you may, Mr. Graybill.

MR. GRAYBILL: It seems to me there are a couple more fundamental objections here, and one is that the report, by its own title, discusses vegetation in the Mount Storm, West Virginia and the Oakland, Maryland area, areas which I think we could all agree are obviously and universally agreed to be different climatology-wise than the area we're studying, and then, on the very first paragraph of the study, it states that contrary to earlier opinion, the major problem confronting growers of Christmas trees in these areas is not air pollution, but a variety of diseases, and so we have a statement in the proposed exhibit that the exhibit is really discussing the condition that is different from our condition, so we are putting in something from a different part of the country about different conditions and putting it when it's spoken of as not being authoritative or useful here, and it seems to me this is an obvious form of negative cluttering of the record. I'd object on behalf of Northern Plains.

HEARINGS EXAMINER: Mr. Peterson, do you have any response?

MR. PETERSON: The report is an evaluation by the two gentlemen mentioned in the testimony of the witness, that was prepared for evaluation at the same time that Dr. Gordon studied the area. It basically shows, and the purpose is limited to showing that there was a difference of opinion between Dr. Gordon as to the effects and as to the effects found by these other two gentlemen, and it details the same areas as Dr. Gordon has testified on very elaborately in the testimony which he has presented here.

MR. SHENKER: I don't think it takes any further evidence, Mr. Davis, to show that Drs. Wood and Pennypacker disagreed with Dr. Gordon, because Dr. Gordon said so in his direct statement of testimony, at page 35, lines 23 and 24, where he specifically recounted his previous statements made under oath in court that Drs. Wood and Pennypacker were lying and cheating. We're prepared to stipulate that Dr. Gordon does not agree with lying and cheating.

HEARINGS EXAMINER: Very well, the objection is overruled. The exhibit is admitted.

Cross, by Applicants

By Mr. Peterson (continuing):

Q Dr. Gordon, with regard to some of the damage that you found at the Colstrip area already from excessive sulfur and fluoride, as I understand it, coming from the Colstrip area, you state that the evidence on that is shown in your Exhibits 233-A through C, which is the sulfur and fluoride contents of the samplings you've taken on the Ponderosa pine needles from the Colstrip area. Now, when were those samples taken?

A I believe in September.

Q How long have those 57 Colstrip homes been burning coal in the

Colstrip area?

A Pardon?

Q How long have the 57 Colstrip homes been burning coal in the Colstrip area?

A I would imagine since the time that Colstrip was reactivated by the Western Energy people.

Q In making your computations, did you consider the fact that most of the burning in that area would be on a seasonal basis?

A Yes.

Q And why would that be important?

A Because of the fact that the fluorides and sulfur that would be emitted during the cooler parts of the season, such as for cooking, for heating of the homes.

Q Could there have been another source of contamination other than the homes?

A I thought about that. I couldn't think of anything else.

Q How large of an area was contaminated from this home burning of coal?

A We don't know entirely yet.

Q What have you found to date?

A Well, we have three what we call Battelle Northwest sites, 1, 2 and 3, on three different compass points from Colstrip. They all are 1½ to three miles -- two miles, pardon me -- and we have taken animals from -- deer-mice -- from each of these. We also have taken vegetation from these, and we don't know currently if one of these sites is higher in fluoride than others. We have not done enough work on it to determine if that is from contamination from Colstrip or if that could be contamination from other things.

Q Isn't it a fact that when you state that the coal burning from the homes is the cause of the damage, that that's your best guess?

A That is my best guess.

Q On page 43 of your statement, you make the comment that "At this point in time, unfortunately, no one knows what the rate of trace metal or fluoride uptake in the Colstrip vegetation, indigenous animals, or domestic animals will be. We have not been able to find a single scientific or popular article which relates directly to this subject." Are you talking there about any studies relating to the effects of trace metals upon vegetation, soils and the like?

A In a pristine area, that is correct.

Q Are you familiar with a study by the United States Department of the Interior, Geological Survey, that was issued on the Four Corners plant in May of 1975 relative to trace elements?

A Yes, I am.

Q Why don't you consider that report appropriate?

A Because it was after the fact, after the power lines went on line.

Q What difference does that make relative to whether or not there are any effects from trace metals?

A They don't have the baseline for that area.

Q Did you have the baseline data for the East Helena studies?

A No, I did not.

Q Then they're both in the same ball park as far as baseline data is concerned?

A In a sense, they are; however, we went outside of the East Helena area, and I don't think the Department of the Interior's data shows that they did any work outside of the area.

Q Were there any studies on fluoride uptakes by Gerhart Eisler?

A I'd have to check through my literature. I can't remember Eisler offhand.

Q Do you know of any reports on fluoride by the National Academy of Sciences?

A Yes.

Q Did you consider that document in making your statement in your testimony?

A You mean the fluoride put out by the National Academy of Sciences?

Q Yes.

A I have interpreted that data many different ways, Mr. Peterson.

Q You don't consider that to be a study on the rate of trace metal uptake on vegetation?

A I consider that study to be a study on the biological effects of fluoride and other things on animals and vegetation, done by scientists who worked primarily for the aluminum industry and testified for the aluminum industry.

Q And of course, your position is that you testified against the aluminum industry and against the sulfur industry and against the power plant industry?

A That is not correct.

Q You have had a history, have you not, of many appearances in courts against each one of those industries?

A And also against the U. S. Government agencies.

Q That did what?

A Poured DDT onto the environment. I also initiated a lawsuit against farmers once for the use of xylene in irrigation ditches.

Q Where was that?

A Missoula, Montana, but they asked me to put up a $200,000 bond, and I was a little short that day.

Q I don't know why. Relative to your research projects that you've had for the University of Montana, the total is approximately three-quarters of a million dollars, as I understand it, from your testimony?

A That is correct.

Q Are you personally salaried any of that amount?

A I get my summer salary, Mr. Peterson, which is 1/9th, I believe, of my 10-months' salary.

Q And the higher we raise your 10-months' salary, the higher you get a summer's salary?

A That is correct, Mr. Peterson.

Q Well, we ought to have some thanks for this last year.

MR. SHENKER: Should we conduct a Board of Rents' meeting now?

WITNESS: Are we going to take a break now, Mr. Davis?

HEARINGS EXAMINER: I was just wondering how much more you had, Mr. Peterson.

MR. PETERSON: Why don't we take a break? I think I'm almost through, and then we can wrap it up.

HEARINGS EXAMINER: We'll take a recess now, then.

(HEARING RECESSED BRIEFLY AT 10:30 A.M.)

The hearing was reconvened at 10:55 A.M., following a brief recess.

HEARINGS EXAMINER: Mr. Peterson.

MR. PETERSON: I have no further cross-examination.

HEARINGS EXAMINER: Mr. Shenker.

CONTINUATION OF EXAMINATION OF DR. C. C. (CLANCY) GORDON

Redirect, by Department of Natural Resources and Conservation

By Mr. Shenker:

Q Yesterday morning, Dr. Gordon, when your cross-examination was commenced by Mr. Peterson, he and you had some discussion about some of the plots which you had a hand in establishing in southeastern Montana. As I understand it, some of those plots were on the Northern Cheyenne Reservation, is that correct?

A That is correct.

Q How many?

A There are three plots, on the Northern Cheyenne Reservation.

Q From the time that you first commenced your work in the area of southeastern Montana which was the subject of your direct testimony and the cross-examination testimony that is in the record, and of course, the exhibits which accompany your testimony, and in addition, the work which is reported on and the documents that you have submitted to the Department of Natural Resources as part of your contract with that Department, all of which previously have been supplied to the Applicants in this proceeding pursuant to discovery through the present time, have you had contact with representatives of the Northern Cheyenne Tribe?

A Yes, I have.

Q Have they registered any complaints, Dr. Gordon, with you, either as to your work or to the work of others, or to the absence of that work?

MR. PETERSON: Objection, hearsay.

HEARINGS EXAMINER: Overruled.

A Yes, they have.

Q Would you describe that for the record, please?

MR. PETERSON: Same objection.

HEARINGS EXAMINER: You may have a continuing objection.

A The primary problem came out this last year, 1975, when Jim Nybo, of Lt. Governor Christianson's office, held a meeting on NIAC and brought in all of the people, federal agencies, as well as state agencies working in the area of Colstrip, Montana. At that time, also, the research group from the Northern Cheyenne was there and presented their complaints about the work that was not being done upon the Northern Cheyenne Reservation. There was, I believe, justification in some of those complaints put out. Afterwards they did tell me that they did not include our work necessarily in that complaint, but that was a private conversation.

Q That was the work that you did do that they were not complaining about?

A That's right.

Q And the work that you did not do, I take it, was the subject of the complaint?

A That is correct.

Q Then Mr. Peterson asked you, Dr. Gordon, about the program for which you are the director at the University of Montana. He also inquired of you as to the number of students whom you directly supervise in their candidacy for a Master's Degree or for the degree of a doctorate. Of the students involved in all the programs in environmental studies, are you the overall director?

A Yes, I am.

Q I take it that since there was a difference of something like 50 students between those that are involved in the entire program and those which you personally supervise, there must be other supervisors involved?

A Yes, there are.

Q Who supervises them?

A That is up to the director of the environmental studies program.

Q And that's you?

A Right.

Q You're responsible for them no matter what the controls you may be able to effect?

A That is true.

HEARINGS EXAMINER: I have the same problem in this hearing, Doctor.

Q Mr. Peterson also asked you if you would be kind enough to find the seven counties to which you had referred in your statement of testimony, Dr. Gordon. Have you located the map in which those counties are named?

A Yes, I have.

Q First, let me ask you a preliminary question, Dr. Gordon. Are those seven counties the ones in which you did your studies?

A Yes, they are.

Q Are they the only seven counties which, in your opinion, will be affected by the Colstrip units?

A No, they are not.

Q First, give us what the seven counties are by name, if you would.

A Yes. I should say this, though, to be perfectly correct. Those seven counties that I was talking about with Mr. Peterson dealt with the agricultural crops and the value of those crops in the seven counties. Our plots that we have for Colstrip for the DNR, as well as for the Environmental Protection Agency, covers much more than those seven counties, but the seven counties I was talking about as far as agricultural crops are concerned are Rosebud, Powder River, Carter, Fallon, Wibaux, Prairie and Custer.

Q What other counties in Montana will be affected by the Colstrip units?

A Big Horn, Treasure, Garfield, Petroleum, McCone, Dawson, and Richland.

Q Dr. Gordon, Mr. Peterson had asked you whether, after the operation of Colstrip No. 1, you had observed the effects of that unit in its operation and the emissions from that unit on the ecosystem in southeastern Montana. The question I want to ask you, sir, is whether injury occurs to an ecosystem only when a visible effect is there?

A No.

Q Why not?

A Injury and damage to that ecosystem can occur when investigation of much of that ecosystem has not taken place. What I mean by that is that pathologists who work in the field, air pollution pathologists, measure only very small parameters of an ecosystem and they do not measure all of the species and the physical parameters within that. The damage does occur below what we consider economic damage. I don't know if that answers your question.

Q In part it does, sir, but let me ask you a little bit more on the same subject. If you were to go out with a trained eyeball and to look at species of vegetation in and around the Colstrip area, and if, as a result of your experience, training, your expertise, you were to see no symptoms of environmental impact upon the species which you looked at, wouldn't that simply tell you that there was no environmental impact on the ecosystem?

A No, that would not.

Q Why not?

A Because the damage could be hidden, first. No. 2, the ecosystem could have already changed from that hidden damage, or replacement or a loss of certain species in that area.

Q You describe damage that could be hidden. As a matter of fact, in the plant pathology fraternity, for some time now, there has been a term, has there not, called the hidden damage theory?

A Yes, there has been.

Q Who was the originator of the term?

A Dr. Moyer Thomas.

Q Who worked for whom when he originated that term?

A American Smelting and Refining Company.

Q Was he charged with the responsibility by that company for assessing economic damage to growing crops and organisms around the ASARCO plant?

A That is correct.

Q And in making that determination of economic damage, did he actually apply the hidden damage theory?

A Yes, he did.

Q Resulting in the payment of dollars to farmers for injuries not seen?

A That is correct.

Q Mr. Peterson also asked you, Dr. Gordon, whether you were going to be or had been looking for non-emission effects, that is, non-stack effects in the species which you will be examining on a continuing basis, and have examined already in and around the Colstrip area. As a matter of practice in the ordinary course of your work, do you look for any effects from any cause?

A Yes.

Q What are some of the causes of effects that you will be looking for and would expect to find that are not related to emissions from the Colstrip units?

A First, we have destructive and beneficial insects. That's exactly why we have Dr. Jerry Bromenschenk working in our lab full-time on the survey and studies of the insects within the

Colstrip area which will be impacted by Colstrip 1 and 2. I also have Laird Hartman, who is just about a week or two weeks away from his PhD working on the fungi from the Colstrip area. Laird Hartman has worked around the Anaconda smelter on fungi and the effects of trace metals on the fungi in the Deer Lodge Valley. These two people are also carrying out some of the work on the insecticides, the fungicides utilized in that area of Montana, and I am carrying out the work on the survey on the use of herbicides throughout that area.

Q Will you also be looking at weather effects?

A Yes.

Q Have you already done so in the work that you have engaged in in the Colstrip area?

A Yes, I have.

Q Then Mr. Peterson asked you, Dr. Gordon, if you could tell him where the ground level concentrations would be damaging to honeybees in the area around Colstrip. Are ground level concentrations particularly important to honeybees?

A No, not unless they're walking.

Q Would you explain that a little bit more?

A Because they have a very large range in the ambient air, very high and very far.

Q What about ground level concentrations as they may affect vegetation? Can you tell us today the specific longitude and latitude of each spot at which you would expect vegetation to be affected by the ground level concentrations?

A No.

Q Why not?

A Because the damage won't necessarily always come from ground level concentrations. The acid rain damage will come during periods of rainfall, for instance. You will have fumigations on the high ridges of ground at the Colstrip area. That's why we put out plots there, where the ground level concentrations will be actually read down in the areas where they have electricity. There's very little electricity on those high ridges. They have no way of putting their monitoring systems there, so they will not relate at all to the concentrations on those ridges as far as when damage comes.

Q Well, as a matter of fact, concern with respect to what some of the folks at EPA call excursions, which means violations of standards for short periods of time and therefore ground level concentrations which are excessive, focus really on acute damage to vegetation?

A Almost entirely.

Q And as opposed to acute damage, I take it there is another type of damage called chronic?

A That is true.

Q When you look comparatively at acute versus chronic damage, based upon your years of experience in environmental studies, Dr. Gordon, can you tell us what is the more insidious and what is of the greater concern to you?

A Chronic damage is by far the most important. It probably causes by far the most economic loss, as well as ecological loss.

Q Why is that true?

A It is the fact that many of these trace metals, as well as some of the gases, accumulate very slowly and insidiously over a period of time during their exposure. They're exposed to the ambient air, which, even at very low concentrations, will continue to accumulate and cause slow, insidious damage to that vegetation, which shows up maybe four, five months after the damage has actually occurred. For instance, you can have chronic fumigation for a whole year and not show it at all on vegetation, like we have on the ZAP plot here, or in the Anaconda area, or in any area where it's polluted, and the reduction of growth occurs the following year. You have less growth, less annual growth to those trees, less growth to the grasses, less growth to the shrubs, and so on, absolutely invisible, in a sense, as far as looking for those acute fumigations that they put in these atlases and so on in their fumigation chamber studies.

Q And the reduction of growth, then, which you describe, comes from the chronic damage?

A That is true.

Q In your discussion with Mr. Peterson, he asked you if there were any substantial timber stands near the Colstrip area. Let me ask you, Dr. Gordon, if you come from the water treatment plant that is connected to the Colstrip facilities on that main road into Colstrip, will you run through any of those substantial timber stands?

A There's timber in there; not much.

Q What do you mean by substantial timber stands?

A It depends upon whether you're looking for it for timber sales or for an ecosystem --the importance of timber stands to a biological ecosystem. The timber stands that are outside of the Custer National Forest as well as off the Northern Cheyenne Reservation -- there is substantial timber through that area. I don't think too many people think of it as timber sales, and this is actually what you call a dominant species which plays a major role for wildlife, for the domestic animals also in there. They are important to those ecosystems and they are substantial throughout the area. They are scattered through the area. This is a grassland, pine, savanna area.

Q Do you know of any existing estimates of the number of board feet of timber in any stands within 25 miles of Colstrip?

A Yes.

Q Can you tell us what those are?

A The largest standing timber in that area is on the Northern Cheyenne. It's 130,000 acres, somewhere in the neighborhood of 400,000 board feet, on the Northern Cheyenne. The Custer National Forest is approximately 380,000 acres and has about -- I'm trying to think right now, but I think it's around 360,000, 370,000 board feet on it.

Q You had a discussion with Mr. Peterson on the subject of needle casting and on a number of occasions discussed with him a bar graph that describes needle retention at various sites in the years 1972, 1973, 1974 and 1975. I am handing you what has been marked for identification as DNR Exhibit No. 225-G and I'll ask you if that is the exhibit you were discussing with Mr. Peterson?

A Yes, it is.

MR. SHENKER: We'll offer Exhibit 225-G.

HEARINGS EXAMINER: What is it? What would you entitle it?

MR. SHENKER: Needle retention.

Voir Dire, by Applicants

By Mr. Peterson:

Q Was this prepared by you, Doctor?

A Yes, it was. It was even drawn by me this time.

MR. PETERSON: We have no objection.

HEARINGS EXAMINER: DNR 225-G is admitted.

Redirect, by Department of Natural Resources and Conservation

By Mr. Shenker, (Continuing):

Q Would you describe for the record that exhibit and its significance, please?

A This exhibit actually was prepared by me for a progress report for ERDA and for EPA. It describes very numerous hours of work that the people from the environmental studies lab carried out on four different plots on vegetation collected there. It shows needle retention for each year's internode of the Ponderosa pine, and it shows the percent healthy needles of those needles being retained. The four sites are, first, South 5 is Poker Jim, which is a lookout on the Custer National Forest about 65 to 70 miles due south of Colstrip, Montana; site South 2, which is the second series of columns, shows good needle retention. This is on Duke McRae's property. Site GB-2 is at Billings Heights, Frank Kampfe's property, and Site GB-1 is on Snooks's property, Sacrifice Bluff, 500 meters from the Corette 180-megawatt power plant.

Q In your discussion with Mr. Peterson on cross-examination yesterday afternoon, he asked you about other species of plants in southeastern Montana which were known to be even more susceptible to air pollution damage, and you discussed with him various species of lichens which had been studied in a report that you said had been prepared by Sharon Eversman. Is that correct?

A That is correct.

Q Was that report done under your supervision?

A No.

Q Who is Sharon Eversman?

A She's a biologist at Montana State University in the Department of Botany.

Q I'm handing you what has been marked as DNRC Exhibit 219, and would you describe that for us, please?

A It is a progress report prepared by Sharon Eversman for EPA, the people we are contracted under. It is a study that she did on lichens on the ZAP plots as well as off the ZAP plots, the ZAP plots being those we've discussed earlier, fumigation plots on Taylor Creek.

Q And does this report describe the material which you were discussing with Mr. Peterson on the study with respect to the various species of lichens as indicators and predictors of air pollution?

A Yes.

Q And is this report an accurate description of those various species which are more susceptible to air pollution damage as described in your statement and cross-examination by Mr. Peterson?

A Yes. More susceptible, even, than Ponderosa pine.

Q That, of course, is the context of the discussion on page 7 of your statement?

A Yes.

MR. SHENKER: We'll DNRC Exhibit No. 219.

(PAUSE.)

Q Dr. Gordon, let me back up for a moment to make sure that the record is correct. When we were talking about the number of board feet of standing timber, I think you said thousands of board feet of timber. One of my colleagues just pointed out to me --

A I should have said millions of board feet. I'm sorry.

Q I thought when you saying it, you were saying millions, but now, on reflection, I think the record was incorrect in that regard.

A Right.

MR. PETERSON: I have just one question.

Voir Dire, by Applicants

By Mr. Peterson:

Q Dr. Gordon, does this constitute the complete report by Sharon Eversman?

A This is her December progress report for the period of time of four months, or therefore, the summer months -- actually, for the last six months of her work, from June until December of 1975.

Q Is there any other data associated with this report?

A The only data would be her previous progress reports, and also, the publications put together by EPA on all of the work being carried out by all four groups.

Q How about the photographs and the photo-micrographs which she took?

A Those are only in 2 x 2's. I can make copies of those and make them available for you, if you'd like.

Q Is she the only one that interpreted the data?

A She is the only lichenologist on this, and she's very good at it, yes.

Q And she's the only one that interpreted the data?

A That is correct.

MR. PETERSON: May I have a few moments to look this over, Mr. Davis?

MR. SHENKER: I can go on.

HEARINGS EXAMINER: Can you listen to him and read that at the same time?

MR. PETERSON: Pete will look at it.

HEARINGS EXAMINER: Fine; go ahead.

Redirect, by Department of Natural Resources and Conservation

By Mr. Shenker (continuing):

Q Mr. Peterson has asked you, Dr. Gordon, if you had not advised the folks who grow Christmas trees, or used to go Christmas trees, before the power plants came, in West Virginia, that they should go buy aluminum Christmas trees. Did you give that advice?

A I said if they were not willing to deal with the coal-fired power plants in the area, yes -- I did give them that advice.

Q Why?

A Because of the fact that the Christmas tree plantations throughout Pennsylvania, West Virginia, and Maryland, are being severely damaged from the emissions of coal-fired power plants throughout all of northeast parts of the United States, including all the way to Illinois.

Q So one alternative is to give up and buy aluminum Christmas trees?

A That is correct.

Q Is that the alternative you suggested?

A No.

Q Indeed, the Christmas tree growers have had a fair amount of litigation in that area, have they not?

A Yes, they have.

Q This is called the Mount Storm area in your conversations with Mr. Peterson?

A That is correct.

Q You had some conversation with him on your testimony with respect to fluoride effects, as opposed to sulfur oxide effects, in which, as I first recall, you first looked at fluoride problems, then focused on sulfur oxide problems, and finally came back to looking at both fluoride and sulfur oxide problems?

A That is correct.

Q Did the power companies employ an independent tester to come in and look at the fluoride concentrations and effects in the area?

A Yes, they did.

Q What was the name of that company?

A Resource -- I'll have to look it up. Resource, Incorporated?

Q It's RRI, isn't it?

A Research Resource, Inc.

Q And that company came to the same area that you did and looked at the same species that you could have looked at, and made its tests available to its employer, the power companies?

A That is correct, to the Virginia Electric Power Company.

Q What did they find in fluorides as compared to what you had found?

A Their data was almost identical to our data. They found the same amount of fluoride in the coal as we did, the same amount of fly ash, and the bottom ash.

Q Hurricane Agnes came through that Mount Storm area at one time, did it not?

A Yes, it did.

Q And immediately afterwards, of course, there was widespread damage?

A That is correct.

Q And immediately after that -- or nothing ever happens that immediately, I suppose,in this world -- the power companies paid substantial amounts of compensation to the Christmas tree growers?

A They paid $450,000 at that time to three of the growers.

Q Even during Hurricane Agnes, were there any findings of violations of national sulfur oxide ambient air standards?

A No, there was not.

Q If there was no acute damage, even during the eye of the hurricane, then how could the Christmas tree growers have been hurt?

A Well, first I should say that there were no monitoring systems there that read the concentrations. As I said to Mr. Peterson, the damage was not caused by -- the major damage in there was not caused by the acute fumigation which occurred during the period of Hurricane Agnes. That damage had been caused year after year by slow, chronic damage to those trees. The primary damage, as I have testified many times, was due to the acid rains throughout the area.

Q In order to have the acid rain, you need rainfall and what else?

A Sulfur dioxide and nitrogen oxides.

Q Are the quantities of sulfur oxides and nitrogen oxides which are projected from the Colstrip units by the Applicants in this proceeding sufficient to cause the acid rains?

A Yes, they are.

Q Are they sufficient to cause the chronic damage such as that which affected the folks in Mount Storm?

A Yes, they are, and yes, they will.

Q This morning, Dr. Gordon, Mr. Peterson asked you about the publication of your methodology of how you do your work. Let me ask you, sir, whether in the course of appearances that you have made in judicial or administrative proceedings, you have testified for boards of arbitrators who were scientists appointed under federal court consent decrees?

A Yes.

Q Did you testify under oath in those proceedings?

A Yes, I did.

Q Did you describe your methodologies in that testimony?

A Yes, I have.

Q And has your testimony been published, in the sense that the court reporter has published volumes of testimony?

A Yes, it has.

Q And have folks in the scientific fraternity, aside from you, submitted descriptions of the same or similar methodology for publication in scientific journals?

A Yes, they have.

Q You had a discussion with Mr. Peterson this morning on the ZAP plots which are described in your statement of direct testimony, but for the record, we ought to say again, what does ZAP stand for?

A Zonal air pollution.

Q And your view was that the concentrations which were to be used for fumigations, that is, artificial simulations of gaseous exposures, were too high, is that right?

A That is correct.

Q How high were they?

A They were at the state annual standard, which is 2 parts per hundred million, or .02 parts per million, and they were at 5 parts per hundred million and at 10 parts per hundred million. The 10 parts per hundred million is the 24-hour standard for the state of Montana.

Q Well, I suppose some folks would say that if you really wanted to show some blistering effects, you ought to have real high standards -- excuse me, high fumigations. Why didn't you think that you should have those high concentrations?

A Because I have worked in many areas where the concentrations are much lower than that, and there is excessive damage. I felt if that type of concentrations was delivered to that vegetation in the area, it would completely destroy the area and invalidate the entire study. I asked for much lower concentrations, lower, realistic concentrations, which I think occur around the Anaconda smelter, the East Helena smelter, the Hoerner-Waldorf plant, which is half of the concentration that we used, 2 parts per hundred million. One part per hundred million would have been the highest concentration I used, and I would have gone much lower than that, down to .001 part per million.

Q Dr. Gordon, this morning you had some discussion with Mr. Peterson on Exhibit No. 227, which is a color photograph of the ZAP plots, and subsequent to that conversation with Mr. Peterson, you then showed him another colored photograph which you described as something that came from a density slicer work done by Jack Taylor?

A That is correct.

Q I have marked for identification Exhibit No. 227-A. Is that the other color photograph which you discussed with Mr. Peterson on his cross-examination this morning?

A That is correct.

MR. SHENKER: We'll offer Exhibit No. 227-A.

Voir Dire, by Applicants

By Mr. Peterson:

Q For the record, Dr. Gordon, so that it might be identified, why doesn't the control plot show on the photograph?

A The control plot does show on the photograph.

Q Where?

A Right here, sir.

Q Why do not the pipings show on that?

A Because the metal color that you have here is not in this particular density as the slicer went across it; therefore, it eliminates that as the density slicer goes across it.

Q Are there other photographs, other than 227-A, that were taken at the time, which show other areas?

A I'm sorry, I'm not following you.

Q Were there other photographs taken other than 227 and 227-A?

A 227-A is 227. It is the same photograph, but now that photograph is put into a density slicer, and this is what you're picking up now, as you remove colors and increase the density of a color, then you can now visually see it.

Q What was the date of the two photographs?

A The 227 -- I believe I have it in my testimony as October the 9th or 8th. It was taken by NASA and I also said it was after greenup, in the fall, after greenup, when the rain started to fall in the area and the vegetation started to green up in the area. It did not green up on the ZAP plot.

MR. PETERSON: No objection.

HEARINGS EXAMINER: Exhibit 227-A is admitted.

Redirect, by Department of Natural Resources and Conservation

By Mr. Shenker (continuing):

Q Dr. Gordon, commenting on this new exhibit, sir, why doesn't the density slicer show in the control plot any difference from, in effect, background?

A Because it is the background. This justifies and substantiates our sulfur content from the control, which is baseline. There was no or little fumigation on that control plot. We could find no evidence that the control plot received any fumigation from the other three sites.

Q Would you tell us again for the record, Dr. Gordon, what does the density slicer slice; what kind of density is it working on?

A It's primarily working on removing all but one shade or one color as it goes across, and you cannot see with your naked eye -- if you color-photo that density, then it brings out things you now can see from the color-photing of a single density.

Q Is this a standard photo-micrographic technique?

A It is for those who do aerial photography and so on, yes.

Q In your discussion further with Mr. Peterson this morning, you were discussing with him the loss of biomass, and I believe you stated you did not expect that there would be a loss of biomass as a result of the first fumigation. Why is that?

A The reason for that is that fumigation was, in quotes, at low concentrations. The vegetation continued to grow during the growing season, but it was losing probably -- there was physiological metabolic damage occurring here; therefore, you have, first and foremost, the hidden damage we previously talked about. Now what happens is that that vegetation that can be fumigated this way has not stored the food necessary for next year's growth and so there will be stunted growth the following year. This happens to trees, when you have a frost damage, for instance, in an area. That damage does not show up that year except for the acute damage that you see on the needles, but you could not show a biomass loss of that tree for that year, until the following year, when the branches don't grow as long, the terminals don't grow as long, and so on, because of the previous year's damage.

Q In your discussion with Mr. Peterson this morning on the definitional differences between injury and damage, I note that he did not ask you about the term, impact, nor did he ask you any questions on Sections 4 or 5 of your testimony, which are the only two sections which specifically refer to impact. Of course, that is a term used in the Montana Utility Siting Act, but I want to ask you about the term, impact. Does it require economic damage to have impact upon the ecosystem?

A No, it does not.

Q Will you always have visible injury in order to have impact upon vegetation?

A No, you will not.

Q In your further discussions with Mr. Peterson this morning, Dr. Gordon, you discussed with him the extent to which a particular species would be an indicator of exposure, depending upon where it stood or where it was found. I have handed you what has been marked for identification as DNRC Exhibit No.

228-A, and I'll ask if you can identify that for us?

A Yes, I can.

Q What is it?

A That is a drawing I made, a bad drawing, of a tree showing the fluoride accumulation on one side of the tree, on the foliage on one side of the tree, versus the other side. This tree is 500 meters from the Corette coal-fired power plant. The side facing the Corette power plant has a much higher fluoride concentration for each year's needles being retained than the side opposite the Corette coal-fired power plant.

Q What is the basis for the data you have on Exhibit 228-A?

A What is the basis of it?

Q Where did you get it?

A From collecting the foliage and then carrying out the fluoride analysis of it.

Q That was done by you or by folks under your control?

A That is true.

MR. SHENKER: We'll offer Exhibit 228-A.

Voir Dire, by Applicants

By Mr. Peterson:

Q When did you prepare this exhibit?

A I prepared this exhibit for a paper I gave in Boston two weeks ago.

Q Is the data that you have written on the exhibit taken from the raw data that you collected in the field?

A It is from materials collected in the field during 1975, and taking vegetation on each side of trees in the Billings area.

Q Is this in the Sacrifice Bluff area?

A That is correct.

Q What is the height of that area in relation to the Corette stack?

A Eye level.

Q Is there any bluff in and around Colstrip that is eye level with the stacks?

A Yes, there are.

Q Where?

A On several of our lookout sites. Liscom Butte is a good example. I think it's about 45 miles eyeballing right down the stack.

Q It's 45 miles away from the stack?

A Yes. It will be impacted when the two are on line.

Q And how far away is Sacrifice Bluff from the Corette station?

A About 500 meters.

Q Relate that in miles, sir.

A That's half a kilometer, which is 6/10ths of a mile; therefore, you have 3/10ths of a mile.

Q Are there any other sources of fluoride in the area other than the Corette stack?

A Yes, there are.

Q What are they?

A They are the Conoco plant, the Exxon refinery, and it is the Farmers Co-op at Laurel.

Q How far is the Conoco plant from Sacrifice Bluff?

A It is probably another 700 meters of 1200 meters.

Q What are the heights of its stacks?

A A little lower than eye level.

Q How far is the Exxon refinery from Sacrifice Bluffs?

A It is the other direction, on the side that has the least amount of fluoride on it, and it should be about three miles, two and a half miles.

Q What about the Farmers Refinery?

A It is at Laurel, 13 miles away.

Q Do any of the oil refineries contribute to the increases in the fluoride that is shown in Exhibit 228-A?

A Yes, they do.

Q By what percentage?

A In our first report to Dr. Albert Tsao, DNR, for our contract, we predicted that one-half of the fluoride in the Billings-Laurel area came from the Corette coal-fired 180-megawatt plant and one-half of it came from the three refineries located in Billings and Laurel, so it would be 50-50 breakdown; however, I carried out a study around the Intalco aluminum plant, where also, the Mobil refinery is located, across the street from the Mobil; 100 meters from the stacks of the Mobil refinery, I carried out fluoride analysis on both sides of the trees; again, that side facing Intalco and that side facing Mobil. The concentrations on the side facing Mobil were much lower than the concentrations found on the side facing Intalco, which was a mile away. Refineries do put out fluorides. They are not as much fluoride as come out of coal-fired power plants.

Q Is the side on which the Exxon plant located -- was that side of the fluoride in the pine foliage -- did it get any contribution from the Corette station?

A Yes, it did.

Q Did it get any contributions from the Conoco refinery?

A It could, yes.

Q And how about the Farmers Union Refinery at Laurel?

A It's a possibility, yes. Billings is a very polluted town.

Q How many trees on the Snooks property did you find in this condition?

A We carried out five trees this way.

Q How many total trees are there on the property?

A There are -- on Snooks's property and Darby's property, Sacrifice Bluff, going up towards the TV station, I imagine there are somewhere in the neighborhood of 500 to a thousand trees.

MR. PETERSON: Mr. Davis, I'll object that the exhibit is immaterial and irrelevant.

HEARINGS EXAMINER: Objection overruled. The exhibit is admitted.

Redirect, by Department of Natural Resources and Conservation

By Mr. Shenker (Continuing):

Q Dr. Gordon, Mr. Peterson was asking you this morning about whether at a number of places in Montana, which are notorious problem pollution places in the historic past, and present, to some extent -- Billings, East Helena, Garrison, Columbia Falls, et cetera -- if there were not violations of standards in some of those areas. Are you aware, Dr. Gordon, whether, at any of the sites to which Mr. Peterson referred, there were no violations and nevertheless, damage?

A Yes, I do.

Q Tell us about that.

A These areas are in Glacier National Park itself; within 7 or 8 miles from the Columbia Falls -- monitoring stations were set up there during 1970-1971, by EPA. There were no violations; in fact, it was a tenth of a part per million, or ten times lower than the state standard for fluoride --

Q Billion?

A Did I say million? Billion, right, a tenth of a part per billion. There was damage recorded and published from Glacier National Park, which was far below the state standards. The same is true in the area of Garrison. The same is true for the area of East Helena. The same is true for the area of Ramsay, Montana and is also true for other places, outside of the state of Montana, such as in the Dalles, Oregon, around the aluminum plant, and also true for the Intalco aluminum north of Bellingham.

Q When you say it's also true for these other areas outside of Montana, are you referring to concentrations of fluoride of less than one-tenth of a part per billion, accompanied by actual damage?

A Yes.

Q Do you know, Dr. Gordon, of instances in which the concentrations of fluoride were at one-tenth of a part per billion or less and nevertheless, there were actual awards for economic damage by scientific arbitrator panels?

A Yes, I do.

Q Substantial amounts of damage?

A Lots of money, yes.

Q Dr. Gordon, the last thing I wanted to ask you about, sir, was one of the last areas of inquiry that Mr. Peterson made of you, in connection with a Dr. Wood and a Dr. Pennypacker. Your comment as to Dr. Wood and Dr. Pennypacker was that their work reflected the fact that they had been cheating and lying. Those are rather harsh words, Dr. Gordon, and I suppose we can understand that in the heat of five days of cross-examination by a panel of five lawyers who came into your laboratory and ransacked all of your files, you might be intemperate and use harsh words, but now, after a period of time has elapsed, and in the cool contemplation of solemn, scientific judgment, do you have, Dr. Gordon, a different term that you would use for Dr. Wood and for Dr. Pennypacker?

A No, I do not.

MR. SHENKER: I have nothing further at this time. Thank you, sir.

HEARINGS EXAMINER: Mr. Peterson?

MR. PETERSON: I wonder if I couldn't look at the exhibit, which is 10 or 12 pages long, relative to the lichen study, Mr. Davis, over the lunch hour. I'd be willing to come back at 1:00 o'clock if you'd like.

HEARINGS EXAMINER: I think that's reasonable. We've got a little time left here. You'll have time to do that First, let's have a little discussion on the exhibits that we've got here. Do you have any other objections other than the ones you've heretofore made to certain exhibits?

MR. PETERSON: No.

HEARINGS EXAMINER: All right, Exhibits No. 220, 221-A and B, 222, 223-A, B, C and D, 224-A, B and C, 225-A through F, 226 through 231, 232-A through E, 233-A through F, 234, 235, 240-A through M, are admitted. Now, Mr. Shenker, I'll hear what you have to say to Mr. Peterson's objections as to the relevancy of Exhibits 236, 237, 238 and 239.

MR. SHENKER: The relevancy of Exhibits 236 and 237 would be the same, Mr. Davis. They are referred to in the text of the direct testimony of the witness. They are for illustrative purposes of the witness's own testimony as to the projections that he makes as to the course of conduct that is likely to be experienced in the Colstrip area, based upon the scientific studies that he has made. Exhibit 237 has the additional relevancy of the cross-check, which is the normal scientific procedure which the witness has testified to by an independent laboratory as to the technique used. Exhibit 238 has the relevancy similar to 236 and 237, illustrative of the witness's testimony with respect to the projection of what may occur, as the witness has described it, in his direct testimony, and on cross-examination. It speaks further to the contention made by the Applicants that the Boards of Health and Natural Resources in Montana should simply trust the Applicants, and if a problem occurs, we have sufficient enforcement powers to solve the problems.

MR. PETERSON: That isn't our position, Mr. Davis.

HEARINGS EXAMINER: Just a moment, Mr. Peterson. I don't think he has finished yet.

MR. SHENKER: No, Exhibit 239 has been omitted from my response. Exhibit 239 is like a number of the other exhibits which have been offered and received. They are, of course, studies done by students done under Dr. Gordon's direction, supervision, and control; other studies done by students at the Environmental Studies Center at the University of Montana, supervised by people who are in turn supervised by Dr. Gordon. The Ramsay, Montana study is a relatively recent one done by students specifically and directly under his supervision and control, and does describe material referred to in his direct testimony and on cross-examination.

HEARINGS EXAMINER: Very well, the objection is sustained; those exhibits are refused. Now, is Mr. Bellingham in a position where he'd like to cross-examine one of these public witnesses? We've got a couple of public witnesses. You fellows may be excused, if you want, and come back at 1:00 o'clock, if that's agreeable.

MR. BELLINGHAM: I am not, right now, in a position to cross-examine.

HEARINGS EXAMINER: All right, we'll recess until 1:00 o'clock, then.

(HEARING RECESSED AT 11:50 A.M.)

The hearing was reconvened at 1:03 P.M., following the lunch recess.

HEARINGS EXAMINER: We're ready to proceed.

CONTINUATION OF EXAMINATION OF DR. C. C. (CLANCY) GORDON

Re-cross, by Mr. Peterson:

Q Dr. Gordon, it is a fact, is it not, that during the time that Hurricane Agnes went through Mount Storm, it could very well have violated the standards that were in effect at the time?

A It could have, yes.

Q Dr. Gordon, how many Christmas tree growers are there presently in Garrett County, in 1975?

A There were quite a few.

Q How many were there in the northeast?

A There are literally hundreds in that area.

Q In the past five years, how many Christmas tree plantation growers had gone out of business or terminated their activities?

A Few, in comparison to the number that are there. I could explain, but I won't.

Q Now, with regard to the ZAP plot, you answered a question on redirect examination that the fumigation of 1/10th part per million was equivalent to the 24-hour standard?

A No, I said two parts per hundred million is the annual average and the ten parts per hundred million is the 24-hour average.

Q Right. Isn't it a fact that the dose that was applied to the control plot which had ten parts per hundred million, that the concentrations exceeded 10 parts per hundred million, more than 1% of the days in the 3-months period?

A It probably did.

Q Do you know of any control technology available for air pollution abatement that will control the ambient air concentrations of fluoride to 1/10th part per billion?

A Yes.

Q In what industry?

A In the aluminum industry.

Q Any in the power plant industry?

A I don't think they have been concerned enough about fluorides up to the present, but I think they will become more and more concerned about it, and I'm sure that the abatement technology will not be too difficult for them to deal with.

Q But as I understand your testimony, even controlling it down to that level will still cause damage?

A Fluoride is the most reactive element in the periodic table. When you deal with a thousand pounds of fluoride, in comparison to sulfur dioxide, you're really dealing with something that's a hundred to a thousand times more toxic to many vegetative species than equal amounts of sulfur dioxide. It's a very, very toxic substance.

Q Do I understand you, then, that even if you get below the level of 1/10th parts per billion, damage will still occur?

A That is correct.

Q So therefore, in order not to get any damage to any vegetation, there should not be any effluents?

A But there is an alternative to that, and the alternative is not to put a polluting source such as that in a prime, agricultural area. You have to put it in a sacrifice area, because that's exactly what happens when you put a fluoride source in an area. You are sacrificing part of that area, and that is why I am against siting Colstrip 3 and 4 at Colstrip, in a prime, agricultural area.

Q In order to arrive at that opinion, you've got to anticipate, do you not, that there is, in fact, going to be a destruction of that agricultural area?

A That is correct. I have made that assumption.

MR. PETERSON: That's all I have.

HEARINGS EXAMINER: Mr. Shenker.

Re-redirect, by Department of Natural Resources and Conservation

By Mr. Shenker:

Q On what do you base that assumption, Dr. Gordon?

A On the assumption of the studies I have done since 1963 around fluoride sources, and working with the farmers, seeing how their farms are bought up in these agricultural areas, where you put these stationary sources of pollution, both sulfur dioxide and fluorides.

Q So when you said to Mr. Peterson that you have made the assumption that there will be destruction of vegetation, that wasn't something that preceded your study, I take it?

A No.

Q You didn't enter your Colstrip studies having already assumed that it would be a bad thing to contemplate all of the destruction that must necessarily take place in the Colstrip units?

MR. PETERSON: Objection; that's self-serving.

MR. SHENKER: The question or the answer?

HEARINGS EXAMINER: Overruled

WITNESS: Can you repeat the question, please?

HEARINGS EXAMINER: Tell him what he didn't think, again.

MR. SHENKER: I don't think I recall, but I'll try another question.

Q Dr. Gordon, when you told Mr. Peterson that you assumed destruction of the vegetation or the farmland around the Colstrip area, was that an assumption that you made, irrespective of the work that you have done?

A No, it was not.

Q Did that assumption, in fact, flow from the work that you have done?

MR. PETERSON: Objection -- repetitious.

HEARINGS EXAMINER: Overruled.

A It flowed not only from that, but also learning more and more about the pollutants that would be coming from that source.

Q Now, Mr. Peterson asked you about damage occuring at a level of 1/10th part per billion for fluoride, which you described as the most reactive in the periodic table, that is to say, the most toxic?

A That is true.

Q Have you actually seen fumigation studies which showed damage to growing organisms at levels of 1/10th of a part per billion?

A Yes, I have. These are Dr. Facteau's (?) studies.

Q You asked for the opportunity and then withdrew that request, in effect, in this re-cross-examination by Mr. Peterson, to explain the Christmas tree growers who are going out of business and the relative numbers. Would you like to comment on that further?

A Yes, I would. I thought I dealt with that a little bit in my testimony, also, and that is the fact that in areas where I have worked on air pollutant problems, one of the things that is noted there, and it's true of the Christmas tree growers, is that once a farmer makes claim that he has damaged vegetation, animals, and so on, he will lose money, because people won't buy those damaged Christmas trees, or animals that are damaged; therefore, once he makes that claim, he has to worry about the long period of time of litigation before he collects any money, and will go out of business, in many cases, once he makes that allegation, "that my trees are damaged," or "my cows are damaged," and so on.

Q It puts him sort of in between the rock and the hard place, doesn't it?

A That's true.

Q Mr. Peterson asked you, Dr. Gordon, whether during Hurricane Agnes, there could have been violations of standards. Let me ask you whether, during a Hurricane Jack that may come through the Colstrip area some time in the imaginable future, there could be a violation of standards?

A Yes, there could be.

Q Is that what really concerns you in Colstrip?

A Not at all.

Q What is your real concern, then?

A My concern is with the low chronic fumigations and the chronic damage that will occur throughout the Colstrip area.

HEARINGS EXAMINER: Overruled

WITNESS: Can you repeat the question, please?

HEARINGS EXAMINER: Tell him what he didn't think, again.

MR. SHENKER: I don't think I recall, but I'll try another question.

Q Dr. Gordon, when you told Mr. Peterson that you assumed destruction of the vegetation or the farmland around the Colstrip area, was that an assumption that you made, irrespective of the work that you have done?

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A Yes, there could be.

Q Is that what really concerns you in Colstrip?

A Not at all.

Q What is your real concern, then?

A My concern is with the low chronic fumigations and the chronic damage that will occur throughout the Colstrip area.

Q With or without Hurricane Jack or Agnes?

A That is correct.

MR. SHENKER: Nothing further. Thank you.

HEARINGS EXAMINER: Mr. Peterson?

MR. PETERSON: Nothing further.

HEARINGS EXAMINER: Very well, thank you.

(WITNESS EXCUSED.)

MR. SHENKER: We will have Exhibit 219 to speak to, Mr. Davis.

MR. PETERSON: No objection.

HEARINGS EXAMINER: Exhibit No. 219 is admitted. Is that the lichen report?

MR. SHENKER: Yes.

HEARINGS EXAMINER: Very good. We'll take a brief recess.

(HEARING RECESSED AT 1:15 P.M.)

Following a brief recess, the hearing reconvened at 1:20 P.M. on March 9, 1976.

MR. GRAYBILL: The Northern Plains Resource Council will call Mr. Peccia.

TONY PECCIA, called as a witness by the Northern Plains Resource Council, having been first duly sworn upon his oath, both as to his written direct testimony and as to the oral testimony to follow, was examined and testified as follows:

(THE WRITTEN DIRECT TESTIMONY OF MR. TONY PECCIA WAS DIRECTED TO BE INSERTED AT THIS POINT.)

STATE OF MONTANA

BEFORE THE BOARD OF

NATURAL RESOURCES AND CONSERVATION

STATEMENT OF

TONY PECCIA

My name is Tony Peccia. My address is Judith Gap, Montana. I am a conductor/brakeman on the Milwaukee Railroad. I am also the secretary-treasurer of the United Transportation Union, Local number 1297. My testimony represents the general feeling of the majority of the members of my Local.

Although I am not directly affected by the construction of Colstrip Units 3 and 4, the environmental effects of its operation or its associated transmission lines, I am interested in the effect it will have on the State of Montana; environmentally and economically. As an employee of the Milwaukee Railroad, the movement of coal by rail as an alternative to transmission lines would greatly increase the revenue of the railroad who are now operating near the break-even point. This increase in revenue would ensure profitability for the railroads operating in Montana and guarantee a job for present railroad employees as well as the hiring of new personnel. I want to stress the fact that working for the railroad is a good job; it pays well and has a lot of benefits not found in a lot of other jobs.

The recent concept of moving coal by unit train has considerably cut the cost of transporting coal. These unit trains consist solely of gondola coal cars and usually operate on a fixed route. The cars are loaded mechanically at the source of supply, transported over existing rail lines, emptied and returned to be refilled. The environmental drawbacks such as spillage by overfilling and noise associated with trains are minimal and can be remedied very easily.

During this period when railroads in the United States are in a difficult financial crisis, extra trains traversing existing routes would add much needed revenue, and long-term jobs. These extra trains would operate with very little added expense other than original cost of cars and locomotives. The added revenue could be used to rebuild deteriorating road-beds. All rebuilding could be done without Federal assistance, which is the case in the eastern part of the United States. According to the Environmental Impact Statement on Colstrip Units 3 and 4, and the associated transmission lines, prepared by the Department of Natural Resources, the movement of coal by unit train would employ an additional 342 permanent employees, 246 of whom would reside in Montana. These additional jobs created by transporting by rail would be distributed over the entire state, providing economic stability for a much greater area.

As a trainman, I can safely say that we don't need Colstrip 3 and 4 and the associated transmission lines when we already have a method of supplying the Pacific Northwest with a source of energy. Montana can still meet our obligation to the rest of the nation without incurring the pollution associated with the plants. We can meet this obligation and provide more jobs to the citizens of Montana by shipping the coal.

EXAMINATION OF TONY PECCIA

Cross, by Applicants

By Mr. Bellingham:

Q Mr. Peccia, how old are you, sir?

A 35.

Q And you reside at Judith Gap, Montana?

A Yes, I do.

Q And you're employed as a conductor/brakeman on the Milwaukee Railroad?

A Yes, I am.

Q And you are a witness for the Northern Plains Resource Council; is that correct?

A That is correct.

Q Who contacted you first from that organization regarding your appearing here and testifying?

A I happened perchance to meet Carl England.

Q And it was suggested by him, is that right?

A He mentioned it.

Q And after he mentioned the possibility of your coming to testify here, he followed up on it and as a result you are here; is that right?

A Well, he asked me and supplied me with some information that I requested.

Q This was information that he requested for your statement?

A No, I requested some information from him.

Q Yes, but did you utilize this information that you obtained from him? I assume you did obtain it from him, did you?

A Right, I did obtain some of this information from Carl.

Q And that you incorporated into your statement?

A Yes, I did.

Q Did anyone help you insofar as writing this statement is concerned?

A No.

Q Who typed it up?

A Northern Plains Resource Council.

Q I notice at the end you state that Montana can still meet our obligations to the rest of the nation without incurring the pollution associated with the plants. I assume that you have not read the transcripts in this case, have you?

A No, I haven't read any of them.

Q You haven't looked at the exhibits?

A No, I haven't.

Q So your statement related to pollution associated with the plants is speculation on your part, isn't it?

A Well, from the information I read from other coal-fired plants, and from the news services, I assumed --

Q And the information you obtained regarding other coal generating plants, this is the information submitted to you by Northern Plains; is that right?

A True.

MR. BELLINGHAM: I have no further questions. Sir, at this time, I would --

HEARINGS EXAMINER: Well, he may have some redirect. This isn't a public witness. This is a scheduled witness and they're entitled to redirect.

MR. BELLINGHAM: I understand.

MR. GRAYBILL: Did you have something further, Mr. Bellingham?

MR. BELLINGHAM: Well, at this time Applicants move to strike all the testimony as well as the written statement of Mr. Peccia and all further witnesses advanced at this hearing by the Northern Plains Resource Council upon the grounds that these statements were not submitted or given to opposing counsel as provided by that certain order dated December 10, 1975 made by the Hearings Examiner in this case, Carl M. Davis, and particularly paragraph 3 therein which states that written statements of all witnesses and all parties shall be prepared and served upon the Hearings Examiner and opposing counsel by January 10, 1976, with certain exceptions that are not applicable to this witness or to any further witnesses that are going to be put on by Northern Plains Resource Council, with the exception of possible surrebuttal witnesses. We further object to any testimony in the record through Mr. Peccia, which includes his written statement, and I might mention at this time that this particular statement was served upon applicants' counsel on February 23, 1976.

HEARINGS EXAMINER: Very well. Your motion is overruled. You may redirect.

Redirect, by Northern Plains Resource Council

By Mr. Graybill:

Q Mr. Peccia, you said that you had asked Northern Plains Resource Council for certain information, and I have read your statement and I notice that your statement concerns the possibility of moving energy by rail, rather than by transmission line. Did you seek any information from Northern Plains Resource Council on the railroading aspect of your statement?

A Nothing on the railroad, except maybe for the cost of the transmission lines as compared to the cost to haul coal by unit trains on the railroad.

Q Well, when you say you didn't get any of the material on railroading, are you familiar with railroading yourself?

A Yes, I am.

Q Why?

A Well, I work on the railroad. That's my job and I'm interested in it.

Q Does the -- would the movement of energy in the form of coal by railroad have any effects, to your knowledge, beneficial to the state of Montana other than those that you've outlined in your statement as resulting from the transmission line? In other words, are there other effects of moving energy by rail than simply saving the building of the transmission line?

A Well, its secondary effects probably also help aid in agriculture, maybe, in the hauling movement of grain because it would keep the prices down. The movement of coal would probably ensure the probability of a railroad, would aid it in gaining more profits. Therefore, probably a lower price hike, or maybe they'll just keep it at a lower level to haul grain from, say, Montana to the coast. This would be one of the secondary effects. If they hauled coal by unit trains, this would also employ people across the state of Montana, instead of just locating them in one place. These men would be spread out which would make it a little better economically over the state than, say, in one place.

Q Do you know of any secondary benefit to agriculture that transmitting the power by transmission has?

A Not to my knowledge at the moment.

Q So one of the points, as I read your statement, is that by moving the energy by rail, there would be secondary effects beneficial to other major segments of Montana's economy, which would not flow if the electrical energy were moved by transmission lines, is that so?

MR. BELLINGHAM: We object on the grounds repetitious and leading.

HEARINGS EXAMINER: Well, frankly I didn't hear the question so I'll overrule you and let him answer it, and then I'll know whether it is or not.

Q You can answer that question.

A Yes.

MR. GRAYBILL: Do you know now, Carl?

HEARINGS EXAMINER: I like those kind of answers.

MR. BELLINGHAM: Obviously it was not leading, judging from the answer.

Q Have you been present in the hearing room this morning?

A I was here earlier this morning, yes.

Q Although you may have asked the Northern Plains for information concerning the pollution effects of these type of plants, you also heard this morning evidence, did you not, that would support your statement that pollution is associated with the building of these type of plants?

A Yes.

MR. GRAYBILL: That's all I have, Mr. Bellingham.

MR. BELLINGHAM: No re-cross.

HEARINGS EXAMINER: Very well, I have no questions, so you are excused.

(WITNESS EXCUSED)

HEARINGS EXAMINER: Next witness.

MR. GRAYBILL: Northern Plains will call Dr. Albert Borgmann.

DR. ALBERT BORGMANN, called as a witness by the Northern Plains Resource Council, having been first duly sworn upon his oath, both as to his written direct testimony and as to the oral testimony to follow, was examined and testified as follows:

MR. GRAYBILL: Now, before Dr. Borgmann testifies, Mr. Hearings Examiner, probably because I gave insufficient directions, I would like to be allowed to ask one preliminary question. That is, I would like to have Dr. Borgmann state into the record in paragraph form his background and qualifications which do not appear in his written statement.

HEARINGS EXAMINER: Very well, you may do so.

MR. BELLINGHAM: Excuse me, I would like to interrupt at this time and I would like to make the objection heretofore me and object to the introduction of any testimony, either written or oral, on behalf of Dr. Albert

Borgmann for the reasons heretofore stated, the fact that the statement was served upon applicants' attorneys last week, which is also true of the statements of Mr. Huff, Mr. Brittan, and Mr. Toole, who follow, I understand in that order of testimony, specifically upon the grounds that these statements were not submitted in time under the specifications of that certain order dated December 10, 1975, made by the Hearings Examiner, and in order to shorten this, sir --

MR. GRAYBILL: Just a minute, this is repetitious. You just made that motion about two minutes ago and it was ruled upon.

MR. BELLINGHAM: That was to Mr. Peccia.

MR. GRAYBILL: No, you listed all of my witnesses from now on, and it was ruled upon and I object to you encumbering the record by repeating a motion that has been made and ruled upon within three minutes.

HEARINGS EXAMINER: Well, you can finish your motion and then I'll hear your objections and then I'll overrule both, but go ahead and make them first.

MR. BELLINGHAM: As usual, Mr. Graybill interrupted with the completion of my motion. I want to make certain for the record that this is a continuing motion and in order to shorten it, that's the reason that I made it at this time as to all of the witnesses.

HEARINGS EXAMINER: Very well, Mr. Bellingham, the motion is overruled and it is my understanding -- the record will show you've got a continuing objection.

Oral Supplement to Written Direct Testimony

By Dr. Borgmann:

I am a professor of philosophy at the University of Montana. I got my PhD in '63. My specialty was the philosophy of technology. I have given public lectures on that topic. I have published a number of papers. I have participated in conferences on that topic and I'm currently working on a book on the philosophy of technology.

MR. GRAYBILL: Will you please state where you were educated?

WITNESS: I got my PhD from the University of Munich in Germany.

MR. GRAYBILL: And how many years have you taught at the University here in Montana?

WITNESS: For five years.

(THE WRITTEN DIRECT TESTIMONY OF DR. ALBERT BORGMANN WAS DIRECTED TO BE INSERTED AT THIS POINT.)

STATE OF MONTANA
BEFORE THE BOARD OF
NATURAL RESOURCES AND CONSERVATION

STATEMENT OF
ALBERT BORGMANN

THE CONCEPT OF NEED IN ENERGY PLANNING

1. The Complexity of Energy Planning:

On any conceivable subject we can collect a potentially infinite amount of data. What normally keeps us from drowning in a sea of information are guiding concepts which aid us in gathering and evaluating the data. It is crucial that one take the data seriously, and the citizens of Montana are indebted to the Board members who have taken upon themselves the burden of studying the mass of information that is accumulating during these hearings. But it is equally important to remember that technical information in and of itself is inconclusive; it becomes finally significant only in light of certain ordering concepts. These concepts are not technical matters; they are, in the present case, reflections of and guideposts for the kind of life that the people of this state want to secure for themselves. To evaluate technical information in view of these guideposts is, therefore, not a matter for technical experts; rather it is a task which is properly entrusted to a lay board, to a group of citizens who are appointed to take responsibility for the welfare of their fellow citizens and of future generations.

2. The Concept of Need in the Utility Siting Act:

Given the complexity and extent of the present hearings, this may seem an awesome responsibility. To a certain degree this is undeniable. But here we must remember that the people of the state, through an act of their elected representatives, have given the Board a fairly firm and clear framework of decision. The Act contains those guiding concepts that were mentioned above. Two of the key concepts are environmental compatibility and public need. One of the crucial requirements of the Act is, after all, that the Board finally grant or deny "a certificate of environmental compatibility and public need." In what follows, I will concentrate on the second of these key notions, public need.

I begin with a few general reflections. Both the proponents and opponents have great difficulty with the concept of need. One reason is the incompleteness of this concept. Presumably we know who needs, and what is needed; but needed what for? What does the public need energy for? What is the basis and the goal of the need? The concept alone does not tell us. It is well to remember, however, that the concept of need does one thing: It implies restrictions on that basis and goal. One can want or demand something on almost any basis and to almost any end. But when one speaks of need, one is expected to have essential and urgent grounds and goals. So it is already significant that the Act never speaks of energy wants and rarely of energy demands, but frequently and prominently of the need for energy.

The Act, however, goes further than that and outlines the context of the basis and goal of energy need. The first substantive statement of the Act stresses "the constitutionally declared policy of this State to maintain and improve a clean and healthful environment for present and future generations." The primary context is one of basic and long-range concerns. The Act does not speak of comforts and luxuries, but of cleanliness and health; it does not speak of what is best for us here and now, but of a concern for the present and the future.

The Act gives further indications of the basis and goal of energy need in Section 16, which provides a list of factors to be considered in the evaluation of an application for a certificate. The list of these factors amounts to an elaboration of the fundamental and circumspective view that is signaled at the beginning of the Act. In particular, the Act calls among others for the consideration of "promotional activities of the utility which may have given rise to the need for this facility" and of "Conservation activities which could reduce the need for more energy." Such consideration, I take it, would serve to bring out the kind of need which has a genuine basis and goal, a need that is not based on promotion or waste. Other factors spell out the concern for the safety and beauty of the land, and for the cleanliness and healthfulness of water and air among other concerns.

3. The Concept of Need in the Wider Context:

The Utility Siting Act and the concept of need of which it speaks are inevitably set in a wider context. I turn to this context not to add something to the Act, but in order to bring out its meaning more sharply.

One is the unspoken context, the set of presuppositions on which most of us agree and which can, therefore, remain tacit. But in difficult situations it is well to make the unspoken explicit. When we speak of need in a serious way, most of us agree that people are entitled to *what they need to be happy*. The right to happiness is the tacit basis and goal of genuine need. Now it may seem that happiness is an impossibly elusive notion. But a little reflection shows that this is not so.

The pursuit of happiness in our time seems closely tied to the technological promise. We have become used to promising one another ever more material benefits through advances in technology. Here is where the need for huge or increasing amounts of energy arises; for energy is the lifeblood of technology. But lately we have become ware of the promise of technology. For one thing, we are coming to realize that we cannot keep the promise forever. The harmless sources of energy have all been tapped or are running out, and now we must turn to the difficult or uncertain sources.

Another realization that is dawning on us is even more striking and significant. It is the growing awareness that more and more material benefits are unlikely to make us happier and happier. This awareness manifests itself in numerous ways: The longing for the "good old days," a desire for a simpler life, the search for stability, the impression that material costs rise as quickly as material benefits. Some of these are vague, others poorly understood. But on the whole, we can say this with confidence: A general rise in the standard of living is not experienced as a corresponding general rise in the level of happiness. There is a surprising degree of agreement on this, as social scientists have found. (I list references at the end of this statement.)

By common experience, then, happiness is not served by technological progress, i.e. by more and more material goods. The kind of happiness, promised by material progress, can no longer be the basis and end of genuine need, if indeed it ever was. And so the Utility Siting Act is an articulation of our common experiences when it outlines a firmer and more basic context of need, namely "the constitutionally declared policy of this state to maintain and improve a clean and healthful environment for present and future generations."

We have lived and acted upon the promise of technology for a long time. The promise has nearly become second nature to us. When we act thoughtlessly, we are almost naturally inclined to proceed by the promise of material progress. We are less likely to do so in our thoughtful moments. Again the Act is in accord with such reflections in requiring thorough examination of proposals to build "additional power and energy conversion facilities" (Section 2). And by insisting that no certificate be granted unless "the basis of the need for the facility" is found and determined, the Act places the burden of proof on the proponents of additional facilities (Section 10).

I conclude with a few words on the national and global context. The considerations above are sufficiently general to show that national or global needs or demands on Montana's energy resources cannot be honored if they are based on the conventional, but now questionable promise of technology. Montanans are in a good position to insist on more genuine needs because they have never been so fully taken in by the promise of material progress and its so-called "needs." In taking a thoughtful approach to energy needs, Montana is at the forefront of a salutary national re-thinking of energy planning.

4. Conclusion:

Unlike the Board members, I have not read and will not be able to read the entire transcript of these hearings. But from the standpoint of an attentive observer and in light of the considerations above, it seems very unlikely that the construction of Colstrip generating units 3 and 4 is justifiable.

5. References

Easterlin, Richard A. "Does Money Buy Happiness?" The Public Interest, no. 30 (1973), 3-10.

Easterlin, Richard A. "Does Economic Growth Improve the Human Lot? Some Empirical Evidence," Nations and Households in Economic Growth, ed. Paul A. David and Melvin W. Reder (New York, 1974), pp. 89-125.

Rainwater, Lee. What Money Buys. Inequality and the Social Meaning of Income. New York, 1974.

MR. GRAYBILL: All right, Mr. Bellingham.

HEARINGS EXAMINER: You may cross-examine, Mr. Bellingham.

EXAMINATION OF DR. ALBERT BORGMANN

Cross, by Applicants

By Mr. Bellingham:

Q Dr. Borgmann, where were you born?

A I was born in Freiberg, Germany.

Q And when did you come to the United States?

A I first came to the United States in '58 as a student. I returned to Germany in '61 and returned to this country in '64 and I have since been a resident of this country.

Q Are you a citizen of this country?

A That's right.

Q And where did you obtain your undergraduate degree?

A I did not obtain an undergraduate degree.

MR. GRAYBILL: You weren't listening, Mr. Bellingham.

MR. BELLINGHAM: Well, that wouldn't be anything new, would it?

Q Would you reiterate then your education. Do you have a master's degree?

A A PhD in philosophy from the University of Munich in '63.

Q No others?

A I did get a master's in German literature from the University of Illinois in '61.

MR. BELLINGHAM: Was that repetitious, Mr. Graybill? I didn't hear him say that.

MR. GRAYBILL: You're doing fine, Mr. Bellingham.

HEARINGS EXAMINER: Well, we're getting off to a good start, fellows. Take your time, remember I've got three kids in college.

Q You are associated as a professor of philosophy at the University of Montana?

A That is correct.

Q And I notice that the next witness, Thomas Huff, is also a professor of philosophy at the University of Montana; is that right?

A That is correct.

Q You are acquainted with him, I assume?

A That is right.

Q Now, Dr. Borgmann, do you have any background insofar as energy itself is concerned?

A As I said, my special field is in the philosophy of technology, and a crucial topic in the philosophy of technology is what technology in the narrow sense, in the sense of machinery, utilities, and so forth, what purpose it ultimately serves, and in that regard I have concerned myself with the problem of energy.

Q Well, you have never yourself made any demand forecasts for any utility company or anybody else, have you?

A No, I never have.

Q Do you know what I mean?

A Sure, you mean a forecast based on unavailable data, projecting.

Q Into the future as to the amount of electricity that may be needed upon a certain system?

A I never have made such projections myself.

Q Now, you refer to the Utility Siting Act, do you not, in your statement?

A That is correct.

Q And I'd like to call your attention to section 70-802, the second paragraph of that. Do you have it before you, sir?

A Excuse me, what section?

Q 70-802, the second section in the group.

A I'm not sure that I have the same --

MR. GRAYBILL: Let's wait a minute; I'll get it for him.

Q We are talking about the --

HEARINGS EXAMINER: Would you wait a moment please. Mr. Graybill went to get a copy of it for him.

MR. BELLINGHAM: I think he has a copy. I thought perhaps --

(pause)

Q All right, sir, the second paragraph of section 70-802 states the following, does it not, and would you follow with me? "The legislature finds that the construction --." Are you with me sir?

A Right.

Q -- "that the construction of additional power and energy conversion facilities may be necessary to meet the increasing need for electricity and other energy." It states that in the Siting Act, does it not?

A That's true.

Q Now then, I'd like to call your attention to --

MR. GRAYBILL: I'd like to object unless you -- you know, you haven't read the statute in the manner in which it was written. It doesn't stop there and it doesn't have a period there, and your question implies that that's what the sentence says, and that's not what the sentence says.

MR. BELLINGHAM: Well, I certainly didn't mean to imply that that was the end of the --

MR. GRAYBILL: It says, "and that such facilities have an effect on the environment," Mr. Bellingham, which is the important forte, of course, or at least part of it, right? And an impact on population concentration, Mr. Bellingham, and an effect on the welfare of the citizens. Now, that's what the sentence says; let's just talk about the law the way it is.

MR. BELLINGHAM: Now, are you through testifying, Mr. Graybill?

HEARINGS EXAMINER: All right, let's go back to the question and answer. I guess we have that clarified.

Q Now, having finished with Mr. Graybill's testimony, I'd like to call your attention now to section 70-814?

A Can you give me the running number within the act?

Q Yes, sir, I'd be most happy to. It's section 14. Does that help you?

A Right.

Q And I'd like to call your attention to subparagraph B; are you with me, sir?

A Right.

Q And go back up -- it states, doesn't it, that, "each utility shall furnish annually to the department for its review, a long-range plan for the construction and operation of the utility facilities." Are you with me, sir?

A Right.

Q "Such plans shall be submitted on April 1 of each year. The plans shall include the following:" In subsection B, "A description of efforts by the utility to coordinate the plan with other utilities so as to provide a coordinated regional plan for meeting utility needs of the region." Is that correct?

A Correct.

Q You read along with me? All right, sir, now you're talking about need, the concept of need in the Utility Siting Act, are you not, on page 2 and thereafter?

A Right.

Q And I don't think I am incorrect in stating you are philosophizing as what the word need means, are you not, and your opinion of this need?

MR. GRAYBILL: Is that a question, Mr. Bellingham?

MR. BELLINGHAM: Yes, sir. There is a question mark after it.

A Well, it's a so vaguely stated question that I will have a hard time answering it. I'm speaking to it; I'm educing evidence in support of my interpretations. Clearly what I've said is my opinion.

Q Yes, that's right. It's your opinion as to what may have been intended by the legislation as far as the word need is concerned?

A I think that's true but vacuous.

Q Well, what do you mean?

A Well, what you say is true; it couldn't be anything other than what I've said. I think the crucial matter is whether what I say is in accord with the act and with the evidence that I additionally cite and support. That, to me, seems the crucial question.

Q Fine. Now, at page 3 you say, "The Act does not speak of comforts and luxuries, but of cleanliness and health; it does not speak of what is best for us here and now, but of a concern for the present and the future." Do you recall that?

A Right.

Q Now, I'd like to talk to you about the phrase "comforts and luxuries." What about electric lights, do you call them comforts and luxuries?

A No, I do not.

Q Do you consider them a necessity?

A I would like to make a distinction. Some that I used for advertising have been considered by some to be luxuries and have been curtailed, but those used for domestic purposes clearly are not luxuries within our context.

Q They're a necessity, then, to domestic use. Would you say that's true regardless of how many electric lights were left on at any particular period?

A No. I think you can be wasteful in domestic lighting.

Q So, it could become a luxury then if too much was used; is that right, domestically?

A That's right.

Q And you mentioned advertising. Do you feel that lights used in advertising are a luxury, unnecessary?

A I think again you can make a principle inquiry into that subject, which is done under the title of sign ordinances, and they are to base the requirements of lighting for advertising on considerations of all other communiques, what public service they use to identify facilities accessible to the public, and you rule out other uses that are considered wasteful. So I think in a qualified sense, yes, there is both something like necessity and something like waste.

Q What about heating in homes? Would you consider that a comfort or a luxury?

A No, I would not.

Q Well, it's a comfort certainly, isn't it?

A It's a comfort which is close to that spectrum of the concept where it borders on need.

Q Well, you use the words comforts and luxuries here with an "and" in between it. I assume that your analysis of those two, the way you use it is synonymous; is that right?

A If they were the same, I would not have mentioned both terms.

Q Well, you use the word "and," a conjunction, between them.

A Right. A conjunction is different from a reiteration.

Q Well then, there is a difference between comforts and luxuries as you use it?

A That's true.

Q And as far as heating is concerned, I assume here again you'd feel if heating is too high, it would be a luxury, is that right, and not necessary?

A Well, again, I think you can make a principle study of this and inquire whether the amount of heating required, in light of insultation, in light of the availability of fuels, is appropriately allocated.

Q And what do you mean by that?

A It seems to me that electricity used for heating in a fully insulated house is wasted. It seems to me that if someone, out of thoughtlessness, rather than for, say, medical purposes heats his -- keeps his home at 76 degrees, that's waste.

Q And you're aware of the fact that increasingly in the past the ranchers and farmers in Montana, as well as elsewhere, have turned to sprinkler irrigation. You're aware of that, are you not?

A Right.

Q And that does take increased electricity, does it not?

A Right.

Q Do you consider that a luxury, comfort or a need?

A I think we have to take this in a wider context. If it's used to grow crops that are in turn wasted, then I think the sprinkling is wasteful, too. If, on the other hand, the sprinkling is used to grow crops that are essential to starving nations, then certainly it's not a waste.

Q Well, how do you differentiate between whether a crop is wasteful or not?

A You can make analyses of input and output of calories, and you can inquire into the use to which crops are ultimately put. I think such measures would establish whether a crop is grown in the context of waste or parsimony.

Q In other words, not only the kind of crop, but also the use to which it's put, is that right?

A Certainly, yes.

Q Well, what about a grain crop, wheat?

A What about it?

Q Well, would you consider that to be a waste or not?

A Well, again it depends. If grain is used to feed cattle to ensure that the meat is nicely marbled, I consider that a waste.

Q Well then, grain that the ranchers use to feed cattle, you consider a waste?

A If it's only used to ensure what until now was considered choice grade, namely marbled beef, which is detrimental to health on top of being demanding on grain, then, yes, I consider that waste.

Q And if that same grain was used to make bread to feed people, you'd consider that not a waste; is that right?

A I would not, no.

Q Well, give me another crop that you may have in mind, besides wheat, barley?

A I'm sorry, I haven't -- all right, what about barley?

A You don't have any in mind; is that it?

A You're suggesting crops; I'm not suggesting crops, so if you want to suggest a further crop, I'll be glad to speak to it.

Q Well, barley. Barley is used for various purposes, is it not?

A Right, that's what I understand.

Q Do you know what purposes it's used for?

A For conversion to malts.

Q Pardon me?

A I take it it's used for conversion to malts.

Q To malts?

A Right.

Q To be used in beer?

A Right.

Q And I assume you'd consider that wasteful?

A Some of the beers that are being produced I don't consider worth drinking and those that drink them I think are wasting their money and their time.

Q Well, you differentiate, then, between the flavor and the taste of the beer, is that right, to determine if it's wasteful or not?

HEARINGS EXAMINER: That's spelled W-A-S-T-E?

A Could you tell me what distinction you draw between flavor and taste?

Q Well, you seemed to draw that distinction here awhile ago. You said some beers are better than others, basically, did you not?

A Both in flavor and in taste.

Q And whether or not a barley was grown for good beer or bad beer would determine whether it was wasteful or not, is that right?

A I'll leave the choice of beer to the consumer. I think the line should be drawn in terms of quantity. Beyond a certain quantity you're not just wasting your money, but also ruining your health.

Q I don't know how good that would go over with your students at the University of Montana, but let's leave it lie where it is now, is that all right? One further question in that regard, do you think the government, one kind or another, should monitor this concept as to whether or not grains or other crops might be wasteful or not?

A The government, are you speaking of the federal or state government?

Q I'm speaking of either one?

A All right. The federal government, for one, is neither really involved in favoring certain economic decisions and in making other economic decisions difficult, so it's a fact that the government has a hand in shaping our habits of consumption. Once that is recognized it becomes a question simply of what kinds of decisions the government should make. It's making decisions inevitably, and so, yes, I believe that we have to hold the government accountable for the types of decisions it makes in regards to our habits of consumption.

Q To go back to my original question, do you think the government should pass legislation regarding our habits of consumption?

A It does so indirectly; it should do so indirectly as well.

Q So you're in favor of that; is that right?

A Right.

Q You are aware, I'm sure, from general reading, if not otherwise, of the fact tnat water and sewage treatments for municipalities are changing over the years; you're aware of that, are you not?

A Right.

Q Partly brought about by the increase in population in our urban centers?

A Right.

Q And we have new systems of sewage treatment and water treatment now that we never had before. You're aware of that, I'm sure, are you not?

A Right.

Q And these new treatments take added electricity, do they not?

A They do, but they also could generate electricity.

Q Well, let's just assume here that they consume additional electricity. Do you believe that that's a wasteful endeavor?

A No, it certainly is not.

Q It's for the good of the people, is it not?

A That's right.

Q And this means that there's going to be a greater demand for electricity insofar as that particular sector is concerned in the future, doesn't it?

A Why is that so?

Q Well, we talked about the additional method and technology involving water and sewage treatment for municipalities, and I say this is going to take additional electricity in the future?

A Well, there are some suppressed premises here which I would not want to accept.

Q What don't you want to accept?

A Well, I take it that in the past the pressure on sewage systems has grown, one because we consumers waste more, secondly because the population has been increasing quite steadily. One pressure we know is decreasing, the other I think we should be at pains in decreasing.

Q What do you think we should decrease?

A Wasteful consumption. Waste has just risen as a function of comsumption.

Q And you're talking about water now and sewage; is that right?

A Right.

Q And you propose that this be done by government intervention also, or legislation?

A It's being done at the moment through grants through municipalities.

Q And what do these grants do for the municipality? It furnishes them money to expand their facilities, does it not?

A Right.

Q Well, there's widespread famine in the world today; is that a fair statement or not?

A It's a fair statement.

Q I guess this is with us almost at any time, in our lifetimes anyway, Dr. Borgmann, isn't it; somewhere there is famine?

A Well, I find that the two statements that you make are at odds since it is true at all times that there is some famine somewhere, but it's not true for the same reasons that there would be widespread famine.

Q Well, you indicated that there's widespread famine today in parts of the world. Did you agree with that? I think you did, didn't you?

A Right.

Q Do you feel that the agricultural industry in the United States should produce as much food as it can in order to alleviate that widespread famine?

A You put a qualify on this, "as it can," yes. If that qualifier is suitably spelled out, I would agree, yes.

Q All right. You're aware of the Burlington Northern fertilizer plant that is planned for the Circle, Montana area?

A Yes.

Q And you've read about it?

A I have.

Q Have you studied it at all?

A I've followed the newspaper accounts of the development.

Q Have you come to a conclusion as to whether or not it's good or bad?

A Again, I think it should be seen in the overall context of agriculture of the United States, and that is the input-output ratio of calories; that is, you have to address the question, how do you get the maximum output of calories? Within that context, we would have to decide whether a heavy advancement of fertilizer is the best way to go.

Q Well, who should make that decision?

A Agricultural experts who study input-output ratios.

Q Would those be governmental experts, or experts coming from the private sector, or where?

A I think we should get disinterested expertise and you'll find it, if you'll find it, at universities and technical institutes.

Q Can you find disinterested experts at universities and technical institutes, do you think?

A I think you'll most likely find them there.

Q You don't think you'll find it in the government sector?

A We have cases where government agencies acted in a way which was clearly not disinterested, and has led to untoward results, so I would not generally accept the principle that government expertise is disinterested.

Q You do not accept it?

A I do not accept it as a general principle.

Q Well, do you accept the principle that experts in the educational field, universities and so forth, are disinterested?

A I think there are some necessary conditions that one who has a claim to be disinterested must meet. If those necessary conditions are not met, I think he should be ruled out as one who is disinterested. That still leaves us with claims to the title among which I think not all have a proper claim to being disinterested.

Q Well, that's true of any sector, isn't it, whether it's an educational field or a governmental field? Some might be disinterested and some might not; isn't that true?

A Well, we can't say more than that. If a nuclear physicist who serves on the board of an energy industry advocates an out-and-out promotion of nuclear energy, I think that testimony should be greeted with caution.

Q Do you remember the question that I put to you, sir?

A Yes.

Q What was the question?

A Isn't it true of any field that we find interested and disinterested people?

Q And do you have an answer to that?

A I think the question is so general that it is vacuous and the answer is, yes.

Q What about the private sector?

A What about it?

Q Well, do you find disinterested and interested people there?

A I suppose you'd have to be more specific.

Q Well, we've talked in generalities and I think the language in your statement is phrased in generalities. Now, we were discussing governmental and educational individuals who may or may not be disinterested in something like a fertilizer plant, and whether it should be allowed or not. Would you put the same qualifications upon people in private industry?

A I would like to respond to the first part of your question, if indeed it is a question, and I think it would be fair to say that I've been concerned to bring matters down to specific cases; I'm not talking generalities. I've found many of your questions difficult to answer because they suffer from generality. As regards the case of the fertilizer plant, I pointed out a context within which a principle decision can be made.

Q Well, we discussed two sectors. We discussed the governmental as well as the educational. Now, I'd like to bring your attention to private industry. Don't you feel that there are experts in private industry that might be disinterested and could be utilized in determining the ultimate result of such a plant?

A It's a logical possibility, yes.

Q Do you have a reservation concerning it?

A You'd have to give me specific cases; then I'll be glad to give a specific answer.

Q When we come and talk about a person's needs, do you feel that somebody on the outside is more capable of defining what a person's needs are, than that person himself?

A In the case of sane adults, the answer is no.

Q You think it's up to the individual; he's in a better position?

A Again I must confess to difficulties in answering your question.

Q Well, you've answered it, sir, I think; did you not?

A Then I'm somewhat puzzled at your repetition of the question.

Q Well, I'm somewhat puzzled by your second answer, I must admit. So that puts us on a par, and why don't we move on to another subject; is that all right?

A It's up to you to conduct the cross-examination.

Q Well, on page 4, at the bottom of the page, you talk of the pursuit of happiness being closely tied to the technological promise, and you say -- skipping a couple of lines -- lately we have become wary of the promise of technology; we cannot keep the promise forever. Do you recall that statement?

A I'd like to call your attention to a misprint; it should read wary. W-A-R-Y.

Q You say the harmless sources of energy have all been tapped or are running out. What harmless sources of energy have been tapped or are running out?

A The ones that have been tapped are the hydroelectric sources. The ones that are harmless and safe and that are running out are oil and gas in this country.

Q And you have three methods of producing energy that you're talking about there as being harmless, hydro, oil and gas. Any others?

A There are none that make, I think, potentially harmless and benign sources of energy, but none of them have been developed that they would figure in a --

Q Well, what other sources of energy are we utilizing now -- excuse me, sir, were you through with your answer? I'm sorry, I didn't mean to interrupt.

A The three harmless and safe ones that you mentioned are the ones that we have to reckon with at the moment. These are not the only possible ones.

Q Well, what others are there?

A Solar, wind --

Q Well, you're talking about the future, now, aren't you?

A That's the point I'm trying -- I'm trying to make a distinction between them.

Q Yes. Well, let's turn back to the present again, if we might, before we go into the future. You're talking about the three that are presently -- that you feel are harmless?

A Right.

Q Now, are there any other sources of energy at present that you consider harmless?

A I think whenever you turn to the other two possible, which I take to be coal and nuclear, you run into difficulties and into detriments that you largely avoid in the case of the first three.

Q And you do not consider coal and nuclear in the same classification?

A I do not, no. I would put them both on the side of the difficult ones.

Q All right, let's turn our attention first to coal. Why do you say that's a difficult one?

A There are difficulties both with the extraction of the coal and with the conversion of coal either into electricity, gas or liquid fuels.

Q What about nuclear?

A Nuclear is a highly contested field which shows at a minimum that it's an unsettled issue.

Q Well, what is your personal opinion of the two?

A I think we should minimize our reliance on them.

Q On both of them?

A I would rank them in what I call difficulties by considering coal less difficult than nuclear, so with that qualification I would like to minimize them both, yes.

Q When you say minimize them, I assume you mean to eventually phase them out entirely?

A No, that's not what I mean.

Q You don't mean we should cut down on nuclear as a source of energy, then, entirely?

A Well, at a minimum I think we should have more time for research and evaluation of the present safety features, and any expansion of the nuclear industry should be contingent on conclusive findings on that score.

Q Do you think conclusive findings can ever be made?

A Conclusive findings in the scientific community have been made and can be made, yes.

Q And you think they can be made as far as nuclear is concerned?

A I think we'll have to insist on them.

Q How long a period do you think that might take?

MR. GRAYBILL: I'd like to object to this line of questioning unless Mr. Bellingham can show the purpose for which he is inquiring about nuclear energy. It seems to me he's far afield, or else he hasn't read the statement and doesn't understand it. I don't understand what the purpose of his line of cross-examination is and I'd like to challenge it.

HEARINGS EXAMINER: Overruled.

Q Would you answer the question, please?

A Could you repeat it, please?

Q Well, I think we're talking about nuclear, and you indicated that there should be an analysis, study, made until we came to a definitive conclusion, did you not?

A On the safety of nuclear plants.

Q Yes, and I asked you how long you think this might take?

MR. GRAYBILL: I think that's an immaterial question, Mr. Hearings Examiner, and I'd like to object. I think it's immaterial how long it might take for nuclear power to be examined in a different context.

HEARINGS EXAMINER: Overruled. The title of his paper is "The Concept of Need in Energy Planning," and I don't know what it's confined to, but he can explain it, I guess.

A How long it might take, that's the question?

Q Yes, sir.

A That's beyond my expertise.

Q You don't have any idea?

A I can speculate if you want me to.

Q Well, I would appreciate it; would you speculate, sir?

MR. GRAYBILL: All right. Now I'm going to object that the question calls for speculation which being in an administrative meeting we generally object to.

HEARINGS EXAMINER: Sustained

MR. GRAYBILL: Trapped, Bellingham.

Q Let's turn to coal. You don't think coal is as bad as nuclear as a source; is that right?

A That's correct.

Q What do you propose as far as coal is concerned?

A That we minimize our reliance on coal as a source of energy.

Q In what fashion? Well, how would you do it?

A Through conservation methods and through the development of alternative sources of energy.

Q You're aware of the fact that the federal government and others foresee the use of coal for some years as a source of energy; you are aware of that, are you not?

A I'm aware of that, yes.

Q You do not object to that approach?

A I think that it would be naive to think that we could get along without coal.

Q Then you're not against the proper strip mining of coal in Montana, are you?

A Well, I don't know if it's appropriate to call attention to the basic point that I make in my statement. That is, that we should be guided by the concept of need in addressing that question.

Q Well, assuming that coal is needed?

A Well, you can't assume it.

Q I'm asking you to, sir. Assuming that coal is needed for the proper generation of electricity which, in turn, is needed by people, you have no objection then in that context to the strip mining of coal in Montana, do you?

A If need is established, the act prescribes that a certificate of siting be granted.

Q And your answer to my question, then, would be yes. You do not have any objection?

A If need is established, I have no objections to strip mining. Could I make an addition to that?

HEARINGS EXAMINER: Yes, you may continue.

A I think all the requirements should be met and need is just one, the other being environmental compatibility.

MR. BELLINGHAM: No further questions.

HEARINGS EXAMINER: Mr. Graybill.

Redirect, by Northern Plains Resource Council

By Mr. Graybill:

Q Now, Dr. Borgmann, when you discuss in this last idea, what you're saying, then, is that the Siting Act has a purpose, and one of the purposes is to identify and properly apply the very concept of need you're talking about, isn't that it?

A That is correct.

Q In other words the statute under which we bring this action envisages proper use, rather than just use; isn't that the concept you're driving at here?

A I think it's one of what I call the crucial and guiding concepts of the Utility Siting Act. It is one that I think we understand much better than the proponents lead us to believe, and I think it's one that is ignored by the proponents without proper cause. It's a concept that can be addressed and which we can speak in a principle manner and which can serve to guide us in energy planning.

Q All right. Now, with relationship to that idea, what is your point about waste? You have discussed with Mr. Bellingham at some great length here various types of waste. Do you think the Siting Act speaks to waste?

A It speaks to waste indirectly by requiring that methods of conservation be inquired into, and it speaks to it indirectly also in requiring the board to inquire whether consumption is based on promotion which would create an artificial need, which I would equate with waste.

Q In other words, when Mr. Bellingham asks you whether this item or that item is or is not waste, and whether this quantity of an item is or is not waste, it isn't this quantification that you're speaking about is it? Isn't it the concept that we must attempt conservation rather than that we must define conservation in each case?

A I think we have to take an inclusive and coherent view of the matter and that's what the Utility Siting Act enjoins the board to do.

Q And what is that view?

A That you have to -- I'm speaking about just one of the key concepts, that being need, and I think the board gives something like a framework in which need can be ascertained, and moreover in my statement I tried to show that establishment of the concept of need fits well with what we know about the concept of need in the world at large.

Q Is it your understanding that the Siting Act enjoins upon this board, and in that sense upon the people of Montana, the duty of utilizing social effort in such a manner as to maximize the environmental results, that is, to help save the environment?

A I think that's clearly stated in the first section of the act.

Q And that the act enjoins the board, and through it the people of Montana, to take whatever steps are reasonably necessary to account for the principles set out that you and Mr. Bellingham went over; isn't that right? For example, the statute that Mr. Bellingham read you, or had you read, talked about the fact that the construction of additional power plants is to be considered, but it's to be considered in a certain context, isn't it, whether or not these plants have an effect on the environment that is overbearing or overbalanced; isn't that the idea?

A That is correct.

Q And I noticed that that sentence not only talked about the impact on the environment, but the impact on population concentration. What do you take that to mean?

MR. BELLINGHAM: We object to this line of questioning on the grounds it calls for a conclusion.

HEARINGS EXAMINER: Overruled.

A Excuse me, would you repeat the question?

Q Well, my point is that not only does the statute talk about building plants only after we have tested the effects upon environment, but also the impacts on population concentration and the effect on the welfare of the citizens. In other words, there's more to it even than environment, isn't there?

A There's something like the social environment which the act requires the board to take into account as well.

Q And then again Mr. Bellingham brought to your attention section 70-814, and he read subsection B which says that the utilities are supposed to check their efforts with the plans of other utilities in the neighborhood. I trust that that isn't the only thing they're supposed to do because there are a whole series of injunctions there, one of which is to involve the environmental protection and land use planning agencies in the planning. In other words, you weren't intending to deny that utilities should work together and do the best they can, were you, together?

A In fact I made my arguments so general as to apply to the need, not just to the people of Montana, but to the need of the public, and that public I take to be primarily Montana's public, secondary that of the Northwest, and finally I think in certain ways we are responsible for our people in this country and the world. However, what I say about need applies to all publics equally well.

Q Do you think it's the duty of -- I know you think it's the duty of the board to look at this need; do you think it's the duty of a power company to examine the need in that sense?

A I think if the power company wants to make a case that has a chance of receiving a certificate, which is certainly not accidently called a certificate of environmental compatibility and public need, they have to address that notion, and as far as I have been able to find out, they have not.

Q Do you mean that the act itself, or the legislature by passing this act has enjoined the duty upon the power company as well as upon the Board of Natural Resources and the citizens?

A I think it's -- I don't think a utility would do it, but they could come in frivolously without satisfying those demands which would ensure a positive finding by the board, but I think if they are to hope that the board will act positively, then it's in their interest to establish need. If they fail to establish need, I don't think they're violating any law, they will just -- I can't see how a certificate can then be granted. So that the law is not directly binding on them; it just spells out the rules of the game for the utilities. They can play a losing game if they want to.

Q Well now, awhile ago, Mr. Bellingham asked you if there wasn't a need for more sewer and water treatment and I think you agreed that there probably was a need for more sewer and water treatment. Is that sewer and water treatment need to be considered independently of the effect, for example, that the power companies themselves may have on the problem?

A No, I think water demands are themselves a function of what I'd call the technological promise and, therefore, water demand is not just a function of increasing population, which incidentally is not increasing all that much anymore.

Q Mr. Bellingham also mentioned -- discussed with you your reference to famine. Is the need for food a need that the society should address itself to through the Utility Siting Act?

A I don't think it is incumbent on the board to address these such specific measures. I would conceive it to be the duty of the board to make a decision which is in a general way compatible with the general notion of need, and I think that can be done in a principle way which then gives a broad context and affirms a certain direction for the development of our standard of living. I think it would be requiring too much for them to spell out in all economic details how that would affect every particular need, but that's not necessary. I think they can do it in a fashion which is encompassing and yet consequential and significant.

Q Well, what I mean is this. If there's a -- let's assume, as Mr. Bellingham is constantly liking to do, that there was a need for food. Would the board charged with the responsibility of enforcing the Siting Act be enjoined to balance that need for food with the need for electricity? Would it be enjoined to try and accomplish any utility siting in such a manner as to maximize the production of food also?

A It depends on what one means by a need for food and it also depends on whose need it is. I can't believe that the board is unaware of starvation around the globe, but the issue has two sides. Food is being wasted in this country; food is lacking in certain third world nations. So a balance should be achieved. That balance can be achieved without the exponential growth in energy, which seems to be what the utilities take to be an explication of need.

Q Do I understand, then, that this exponential growth that you speak of is -- what you're saying, then, is that in addressing the issue of need, we must have criteria based on experience rather than criteria based on a mathematical formula?

Q Well, the way it works is that you look at available evidence and it admits of many interpretations, so we have to look at the evidence clearly, but the evidence itself indicates, say, the past history of energy consumption, does not give you a conclusive answer to what the future should be like, allows both technically of various interpretations, and at the bottom of those you'll find issues that revolve around the notion of what type of life you want to have. These are fairly fundamental and intelligible issues, but they're not technical alone.

MR. GRAYBILL: I think that's all I have Mr. Bellingham.

HEARINGS EXAMINER: Mr. Bellingham?

MR. BELLINGHAM: I have a couple here.

Re-cross, by Applicants

By Mr. Bellingham:

Q You are of the opinion, I'm sure, are you not, Dr. Borgmann, that the Board of Health in the Planning and Utility Siting Act will come up with a proper decision based upon the facts and the evidence produced in this case?

A The Board of Health has already come up with a conclusion.

Q What about the Board of Natural Resources?

A I think it's a working assumption that the board is composed of a group of citizens who are chosen so as to represent the citizens of the state and, depending upon what interpretation you take of the region, that they will come to an appropriate decision. Nonetheless, the act itself envisages judicial review, so it's not in any judicial sense a final finding.

MR. BELLINGHAM: No further questions.

HEARINGS EXAMINER: That's all. Thank you, sir.

(WITNESS EXCUSED)

MR. GRAYBILL: We will call Dr. Thomas Huff.

THOMAS HUFF, called as a witness by the Northern Plains Resource Council, having been first duly sworn upon his oath, both as to his written direct testimony and as to the oral testimony to follow, was examined and testified as follows:

MR. GRAYBILL: Mr. Hearings Examiner, I'd like to have Mr. Huff begin his testimony by stating his background and qualifications in a paragraph.

HEARINGS EXAMINER: Very well.

Oral Supplement to Written Direct Testimony

By Dr. Huff:

My name is Thomas Huff. I received a bachelor of arts degree in philosophy at the University of Colorado and a PhD at Rice University. The PhD was received in 1967. My area of specialization is liberal democratic political theory and the philosophy of law, and I am in my ninth year of teaching at the University of Montana.

(THE WRITTEN DIRECT TESTIMONY OF DR. THOMAS HUFF WAS DIRECTED TO BE INSERTED AT THIS POINT.)

STATE OF MONTANA

BEFORE THE BOARD OF

NATURAL RESOURCES AND CONSERVATION

STATEMENT OF

THOMAS HUFF

JUSTICE AND ENERGY POLICY

The single most important environmental impact of Colstrip 3 and 4 is its impact on justice. Indeed, in Section 2 of the MOntana Utility Siting Act of 1973, the constitutionally declared policy of the State of Montana " . . . to maintain and improve a clean and healthful environment for present and future generations; to protect the environmental life support system from degradation and prevent unreasonable depletion and degradation of natural resources, . . . "is acknowledged as the policy guiding the planning and approval of energy generation and conversion plant sites and associated facilities. But what does it mean to " . . . maintain and improve a clean and healthful environment . . . and prevent unreasonable depletion of natural resources . . . for present and future generations . . . "? (Emphasis added.)

We often think of justice as obtaining between men in a particular generation, indeed, that is how we usually face the issue of justice. We talk of justice to Blacks, to Native Americans, to owmen, to the poor, and to the victims of crime, and we readily conceive the problem of justice in the context of what are the fair shares of society's burdens at a particular time. Yet each generation also has responsibilities to be just to future generations. A well known moral philosopher of our time has called it the matter of "just saving." To provide "just saving," he says, "each generation must not only preserve the gains of culture and civilization, and maintain intact those just institutions that have been established, but it must also put aside in each period of time a suitable amount of real capital accumulation." (John Rawls, A Theory of Justice, p. 285). Surely it is this sense of justice which gives meaning to the constitutionally declared policy acknowledged at the beginning of the Siting Act, and it is, therefore, this sense of justice which must guide the decision on Colstrip 3 and 4.

What then, we might ask ourselves, is our fair part of the burdens and benefits to be shared between generations. Certainly the last two or three generations have left us a remarkable legacy of benefits. They have accepted the burdens of pioneership and settled this remarkable land. They have given of their resources to develop our extraordinarily powerful scientific knowledge and technology. They have given us a medicine that sustains our health; fertilizers, herbicides and pesticides to protect our food crops; synthetic fibers for our clothing; a healthy business community to provide our goods; at least two major wars to protect our political institutions; fine educational institutions to consolidate, sustain and improve our cultural and technological heritage, and many other such advantages. They have done their fair share of meeting the requirements of just savings, but they have not, as generations before them have not, left the new generation, our generation, without distinctive and in some cases unforeseen problems. Indeed, for all that previous generations have given us, they have left us with at least two extraordinarily difficult problems: First, the problem of scaling down our patterns of growth, and, second, the "making just" the use of the world's limited resources. These two problems arise for us because we now know that the world's resources are limited, and that to place an ever increasing demand on those resources is foolhardy. We know, too, that our ability to use these resources depends, as the Draft Environmental Impact Statement points out, on an increasingly complex, interdependent, and fragile system of resource production and use, (Draft EIS, pp. 331-334), and we know that if we continue to depend on this increasingly fragile, because increasingly complex, super-system of production, we may provide the next generation with profoundly insoluble problems. No generation could act more unjustly to succeeding generations, and nothing could be farther from absorbing a fair share of the burdens between generations than to leave a future generation with problems of unmanageable proportion. This is what we will do, however, if we do not now take steps to acknowledge and reduce significantly our luxurious and imprudent demand for energy and other resources.

Our generation and future generations will need power, but we will also need life styles which will demand less power. If we simply accept current patterns of demand as the determining factor in supply, without careful consideration of the fairness of our demand, then we also, I believe, accept the real possibility of acting unjustly to future generations, and this, I'm afraid, is precisely what the Constitution of the State of Montana asks that we avoid.

EXAMINATION OF DR. THOMAS HUFF

Cross, by Applicants

By Mr. Bellingham:

Q How old are you, sir?

A 36.

Q And there is no question you're a compatriot of the gentleman that just appeared on the stand, are you not? Dr. Borgmann?

A A colleague, yes, sir.

Q You're on the same staff?

A Yes, we are. Yes, indeed, I'm the chairman of the department.

Q Now, you say your specialties are -- would you explain what they are?

A Liberal democratic political theories usually are considered to have begun with Bentham and Mill in the 19th century and come forward in the 20th century in works of people such as Hobhouse, and finally forwarded into works of such political theorists as John Rawls and Joel Fineberg. It is an attempt to understand the social ideals which we as liberal democrats share, attempt to give those some kind of reflected expression. The philosophy of law is similar to that in that it, too, attempts to give expression to shared ideals as they may occur in certain parts of our legal tradition.

Q Have you had any background in load forecasting at all?

A No.

Q You have never worked for a company of any kind in the private sector that dealt with energy production?

A No, I haven't.

Q You strongly advocate, apparently from your statement, the process of reducing our demand for energy and other resources?

A No, I only warn that if we are to be just to future generations, that we must be careful and cognizant of our use of energy so that future generations will have provided for them the same kinds of energy -- I mean by kinds the same energy needs will be met as have been met for us -- I'm particularly concerned that in order for individuals to realize their life plans, individuals in the best liberal sense of the term, that is, individuals who can make choices for themselves, live in communities in which there is enormous diversity, that they be provided with energy sufficient to accommodate what I guess I would call basic needs, and I believe that we need to be very careful that we don't discount the future well-being on the basis of the time preference which we happen to have of our citizens.

Q Now, you talk about luxurious and imprudent demand for energy, do you not?

A Yes.

Q What do you mean by that?

A Well, let me back up and explain that it seems to me that in order to express our respect for other human beings, we must consider their freedom and their well-being. And those are curiously empty comcepts unless we ask ourselves what constitutes their well-being, and if we are willing to answer the question as to what constitutes their well-being, we are going to have to connect that in some way or another, it seems to me, with their needs. That is, what they need is what is necessary for them to achieve some kind of well-being, to achieve some kind of human excellence, to realize their nobility. And I think that, as in many other areas of the law, we have to limit the activities of individuals in the realization of those needs in reflection of the needs of others. I think the main thrust of my paper is that we need to be very careful in our generation or in the next couple of generations that we do not use a share of the fruits of the earth which we must share with future generations.

Q You mentioned that we must limit activities of individuals; how do you propose to do that?

A Well, I take it that if we live together in a social community, you and I, and unless by some accident we are all able to simply move about easily without ever conflicting with one another, then I take it that we must have some means of limiting the activities of one another. I take it in some cases we use police and in some cases we use regulation and in some cases we use other things, but in various ways we establish law and the law expresses our social ideals in terms of what we count as harms to one another and what do not count as harms to one another. If a man burns garbage in his backyard and I have to smell it, we typically think of that as being a nuisance in which what he has done harms me. There are always, of course, areas in our kind of political theory where it's difficult to know exactly when a harm has occurred and when it hasn't.

Q Well, let's turn our attention, then, to your approach that you used here at the end, to a more specialized topic as far as limiting activities of individuals insofar as their demand for energy is concerned. Do you believe that must be accomplished in the future?

A Certainly.

Q And how do you propose to do that?

A I propose to do that, it seems to me, in the same way that we attempt to accomplish these limitations in all other circumstances; that is, by the establishment of boards, such as the Board of Natural Resources, to express our ideals with respect to the demand for energy. We do the same thing in almost all areas of conflict. We use legislatures and courts and so forth to try to get those social ideals expressed.

Q Well, don't you think it's necessary to go beyond the format of the Utility Siting Act to limit this activity of individuals insofar as their demands for energy are concerned?

A Not at all. The Utility Siting Act addresses directly the concept of need; it directs, I take it, the board to address that question and to express our shared ideals in that regard.

Q Well, what if generating units are so limited that the needs of individuals and industry far outstrip the resources available, what then?

A It, of course, depends upon -- if you and I agree about the kinds of need, then, of course, it's clear that we are going to need additional energy resources. It's also clear that we have to ask, though, the question as to whether the need which we count as a present need is a need which will continue, and indefinitely, and if in continuing indefinitely if we don't have to care about whether or not our use of these resources, as I said earlier, reflects merely the time preference which we happen to have.

Q Well, assume that there is a valid demand and need in the future for electricity, and for some reason our resources are not enough to meet that need and demand? What will be the effect of that?

A You mean all of the demand in the future and our own?

Q Yes.

A Well, it seems to me what we have to do is be sure that we share that scarce resource, and share it in some way that optimizes its value for future as well as present generations.

Q Well, what if as a result of misapplication of the statutes or laws, whatever they might be, that there is a valid demand and need for electricity in the future and our resources just do not meet them? I'm talking now -- let's specifically concentrate on industry. What's going to happen to industry in that case?

A Would you repeat the whole question?

Q Assuming that there is a valid industry demand and need for electricity and our resources are not enough to satisfy that?

A Yes, then we have to scale down, do we not? That is, we have to scale down our industrial use of energy, but scaling it down now, if as you say it's a valid need, is merely a reflection of our desire to be just to future generations. Namely, not to force them to have to scale it down disproportionately to how we have to scale it down.

Q Who's going to determine the allocation in such a case?

A It seems to me we are. That is, we in terms of citizens, we in terms of our legislature and writing the Siting Act, the Board of Natural Resources and others. We are simply going to express our sense of justice with respect to energy policy in our choice.

Q Well, let's turn quickly to the problem of strip mining of coal. You're aware that this is being done in Montana at present, of course?

A Yes.

Q Are you in favor of strip mining of coal in Montana?

A I'm not qualified to say whether coal should be strip mined in Montana. I've only addressed in my statement the issue of justice, and have asked in a sense in my statement the board to address that question in making the decision. I have not been privy to the discussions here over the course of the last year and I'm not technically knowledgeable about the strip mining of coal.

MR. BELLINGHAM: No further questions.

HEARINGS EXAMINER: Mr. Graybill.

Redirect by Northern Plains Resource Council

By Mr. Graybill:

Q Well, Dr. Huff, Mr. Bellingham has just asked you in the last two questions to assume a need. In other words, to assume that there is a need for electricity which Dr. Borgmann might have argued with or which you might argue with in another context, but let's assume Mr. Bellingham's need. Doesn't that still leave us a problem which the Board of Natural Resources has to struggle with under the Siting Act, or a series of problems. First of all, doesn't that leave us with the problem as to whether or not the rights of others are to be violated because of that need?

A Yes, of course. Not only the rights of those in our own generation; the rights of those --

Q Well, let's stop with the rights of those in our own generation for a moment. Now, let's identify some of those for the board and for Mr. Bellingham. What are some of the rights that the board still has to contend with, even assuming a need, if it's to site the plant at Colstrip?

A I guess what I would like to say is that all of the rights which we have as individuals which involve claims upon others are -- I guess I mean not all of them are involved in this energy issue. Property rights of certain kinds are certainly involved.

Q All right. In other words, the property rights of people that live in Colstrip, right?

A Yes, and the health rights, I presume.

Q The health rights and the rights to groundwater nonpollution, and in other words --

A Yes, the right to the basic needs.

Q Well, the whole impact on the local community of this plant is an issue the board still has to pass upon even after it admits there's a need, isn't it?

A Of course. That's an issue of justice, yes.

Q And that's an issue that this Siting Act lays right at the lap of the board, isn't it?

A Yes, very definitely.

Q Granted a need, which we don't have to grant, but granted a need, there still is the problem of the individual rights of other property owners than the property owners who happen to be called applicants in this case?

A Of course.

Q Now, in addition to that whole set of rights that the board has to decide about, isn't there a similar set which you started to allude to a moment ago as to the rights of future generations, or the whole future?

A Yes.

Q And what are those rights, some of them?

A Well, in order to be able to live an effective life in a liberal democratic society in accordance with our social ideals, individuals must have the opportunity to make responsible choices. They must live in an environment that supports them; they must find a social circumstance of the kind that supports them; they must have sufficient food and health; they must have sufficient basic creature comforts in order to be able to live such a life.

Q All right. But are you talking about the current generation, and let's talk for a moment about the future. What are some of the things that the Board of Natural Resources has to consider about the future? Doesn't it have to consider whether it's the -- whether we have created something that will change the environment that Dr. Gordon was talking about this morning, so it will simply be a different place 30 years from now?

A Yes, of course. Yes, we have to be sure that we've not -- I think it was Jefferson that once said that we are sort of stewards of the environment.

Q In other words, that environment -- there will be a place called Colstrip 50 and 100 years from now, whether it's the same as today, right?

A Yes.

Q And the board has the real affirmative duty here of considering whether this particular use proposed by the applicants will be fair or just, as you put it, to those people in the future generations; isn't that what you're talking about?

A Yes.

MR. BELLINGHAM: Objected to as leading, sir. I move to strike the response.

HEARINGS EXAMINER: Overruled.

Q All right. Now in addition to that site, that is the fact that the site there and for that matter the site along the transmission line might be changed by the action of the board here; doesn't the board also have a future obligation to consider whether the resource, namely the coal he's talking about being strip mined, and the water, whether these resources are best used in this matter, even granted the need; isn't that a future need or a future justice problem?

A Yes, whether the resources are best used now, most efficiently used now, not wasted now -- if we in our generation use these resources in a very inefficient fashion, then the resource will be unavailable at a time it may be much more valuable in the future.

Q Dr. Huff, there's been testimony here of a technological nature to the effect that there are two layers of coal at Colstrip called the Rosebud seam and the McKay seam. Now, I don't expect you to know this, but let's assume something further.

Let's assume that the power companies here propose to dig up only the top one and then rebury the bottom one. Would that be the sort of issue that the board should face in determining whether the future generations are being properly protected here?

MR. BELLINGHAM: We object on the ground that it is leading and calls for a conclusion, invades the problems of the board.

MR. GRAYBILL: It's not leading.

MR. BELLINGHAM: You haven't asked anything but a leading question, Leo, that I recall.

HEARINGS EXAMINER: Overruled. Let's see if his position is still the same as it was on strip mining.

A It seems to me that in each case, whether we are asking the question of whether we should strip mine or mine below the surface, I guess you call it, whether we should take the first or the first and second -- all those issues are issues that address the question of our need and the question of our justice to future generations. They are all questions which involve a costly expenditure of human and natural resources, and anytime those resources are used, it seems to me we have to ask the question of whether we're using them fairly.

Q Now, again assuming the need Mr. Bellingham likes to assume, isn't there a further question of whether the resources that we have there are being put to their best use? I'm not talking about the future, but about the present best use of the resources, and doesn't this question of whether we should mine one layer and bury another layer, doesn't that go to the issue of whether or not we're making the best use of the coal resources?

A Yes, it seems to me that if we are to save our fair share of resources for future generations, then we have to ask the question of whether burying a seam of coal is efficient and good in that respect, if it's worthwhile for the future.

Q And similarly you could ask the very basic question of whether this is the best use of the coal, to use it in this manner to produce power at this time for export to the Pacific Northwest or for whatever other purposes you're going to put it to?

A Yes, of course.

Q All right. So, these are also questions of justice which the statute enjoins upon the Board of Natural Resources if it's to determine the basic issue of the Siting Act, even assuming that a need exists; isn't that so?

A Yes.

Q And then, isn't there a final sort of almost simplistic, but nevertheless basic, question that has to be asked by this board, and that is, is this the best site? Isn't there a question implicit in the Siting Act that if we're going to determine whether a site is a useful site for a particular purpose, that there might not be one a lot better somewhere else?

A Yes.

Q So the basic question of site itself, of situs of the plants, whether they should be in Colstrip or Butte or Seattle or Portland, or for that matter Circle, this whole question is thrust upon the board even assuming that a need is there; isn't that true?

A That's correct.

Q So, I take it then, from reading your statement and from your answers here, that granted that there's a whole issue of whether there is a need for increased electrical power, and I don't mean that you have made any study and have done any demand studies for any public utilities -- I take it your background does not fit you for that. But assuming that there's a problem of need, and laying it aside, there is a secondary series of problems that you're trying to address here as to fairness to other people, and the proper utilization of the environment, and the proper influence that this plant might have on the future generations, and the best use of our natural resources and the adequacy of the site itself. All of those questions apart from the need question, is that what you're addressing in this statement about justice?

A Yes, each and every one of those.

MR. GRAYBILL: All right. That's all the questions I have, Mr. Bellingham.

HEARINGS EXAMINER: Mr. Bellingham.

Re-cross, by Applicants

By Mr. Bellingham:

Q Sir, do you know how many seams of coal are located in the Colstrip area?

A No. I have no idea.

Q It's beyond your scope, isn't it?

A Yes, sir.

Q Is this the first time you've heard of the Rosebud seam of coal?

A Yes, it is.

Q And the McKay seam of coal?

A Yes, it is.

MR. BELLINGHAM: No further questions.

Re-redirect by Northern Plains Resource Council

By Mr. Graybill:

Q Well, I just have this further question. But you don't need to know the names of them to know that it's not very smart to bury one and dig one up, do you?

MR. BELLINGHAM: Now, just a moment. We object on the ground that it's hearsay.

MR. GRAYBILL: I'll tell you what I'll do. I'll rephrase that question, Mr. Bellingham, if you'll just sit back a minute. I'll withdraw that one and rephrase it.

MR. BELLINGHAM: I don't think you can, Leo, without making it leading.

MR. GRAYBILL: Well sit around and see.

HEARINGS EXAMINER: He can withdraw it, and we'll see what happens next.

MR. GRAYBILL: All right. That one's withdrawn.

Q Does it make any difference to your theory as expounded in your paper that the Siting Act involves the board in a decision concerning justice? Does it make any difference to you the names of the seams of coal to that principle?

A No, of course not.

Q And if we indulge ourselves in an assumption that there really are two layers of coal there, and we can further assume here that the two layers are only twelve feet apart in many cases, doesn't that automatically raise an issue of justice under your theory and under the Siting Act?

A Yes, it does because it seems to me that the burden of proof would fall on whomever wishes to withdraw the first seam to show that it would not also be wise to withdraw the second since there are resources used in the withdrawal of the first, which I assume from the notion of one being on top of the other would have to be duplicated later to withdraw the second.

MR. GRAYBILL: All right. I think that's all the questions I have, Mr. Bellingham. Did I get by the point, Mr. Bellingham?

MR.. BELLINGHAM: I'm tired of objecting to leading questions, Leo, if you want to know the truth.

HEARINGS EXAMINER: Do you have anything further, Mr. Bellingham?

MR. BELLINGHAM: I have a lot of them, but I don't think I'll ask them.

HEARINGS EXAMINER: You are excused. Thank you, sir.

(WITNESS EXCUSED)

HEARINGS EXAMINER: Let's take a recess.

(RECESS AT 2:55 P.M.)

Following a brief recess, the hearing reconvened at 3:10 P.M. on Tuesday, March 9, 1976.

MR. GRAYBILL: We will call Gordon Brittan.

GORDON G. BRITTAN, JR., called as a witness by the Northern Plains Resource Council, having been first duly sworn, both as to his written direct statement and as to the oral testimony to follow, was examined and testified as follows:

HEARINGS EXAMINER: Mr. Graybill, do you want him to start out with his --

MR. GRAYBILL: Yes, I'd like him to make, would you please, Mr. Brittan, make one statement about your background and qualifications, for the record?

WITNESS: Yes.

Oral Supplement to Written Direct Testimony

By Dr. Gordon G. Brittan, Jr.

My name is Gordon G. Brittan, Jr., associate professor of philosphy at Montana State University at Bozeman. I received my B.A. from Amherst College in 1962; my Ph.D. from Stanford University in 1966. I've been a resident of this state for four years. And my areas of specialization are the philosophy of science and logic.

HEARINGS EXAMINER: Is there anything further, Mr. Graybill?

MR. GRAYBILL: No, that's fine.

(THE WRITTEN DIRECT TESTIMONY OF DR. GORDON G. BRITTAN, JR. WAS DIRECTED TO BE INSERTED AT THIS POINT.)

STATE OF MONTANA
BEFORE THE BOARD OF
NATURAL RESOURCES AND CONSERVATION

STATEMENT OF
GORDON G. BRITTAN, JR.

The power companies' case for the building of Colstrip units 3 and 4 rests almost entirely on a projection of demand for electricity in the Northwest, a projection based on past use and not on any consideration of basic need. The logic of their case needs to be examined and the question of projected demand to be placed in long-range perspective.

We can begin with the figures contained in the impact statement ordered by and written for the power companies. The central fact (see Table 1.3-1 and Figure 1.3-1) is that in the early 1980's, even with the contribution of Colstrip Units 3 and 4, there will be a large and steadily increasing shortfall. The logic of the power companies' case, built on these same demand projections, can only require that Colstrip Units 5, 6, 7, *ad infinitum*, be built. Note in particular (see Table 1.3-4) that even with Units 3 and 4, by 1984, the Puget Sound Power and Light Company's resource deficit will be *ten times* that which it is in 1974-1975. Perhaps the point can be put in the form of a paradox: the power companies' case rests on a projection of demand which, they are the first to admit, Colstrip Units 3 and 4 can only very temporarily satisfy.

The larger implications of this logic, which applies to any projected exponential increases, can be appreciated if we put the question of demand in the long-range perspective which the Utility Siting Act urges. A number of studies have appeared in the last year or so on the demand for energy in the United States projected into the next century. The most recent (August, 1975) comprehensive summary of these studies is in a report prepared by the Hudson Institute for the Energy Research and Development Administration.[1] The report makes chilling reading. "From a gross input of 72 quadrillion BTU (quads) in 1972, total energy consumption as delivered to using sectors should be somewhere between 94 and 122 quadrillion BTU by 1985, and between 174 and 340 quadrillion by 2025." Assuming intermediate growth, the figure for 2025 is around 260 quads. In other words, in 50 years' time energy consumption (projected on the basis of exponentially increading demand) will nearly have quadrupled. At the same time , conventional and presently available technologies will be able to supply less than half of the total. Bioconversion, solar, geothermal, and fusion (as contrasted with nuclear fission) sources of energy are lumped into the calculations to make up the difference. But all of these involve very large unresolved technical difficulties. I don't think it's too much to say that claims that projected demand will be satisfied past the year 1985 are based on a hope and a prayer that the inventive abilities which brought us to the present perilous point will miraculously save us.

Even if demand could be continuously satisifed, the still longer-range consequence is hardly more satisfactory. According to the calculations of Robert Ayres and Allen Kneese (of Resources for the Future):

> "Present emission of energy is about 1/15,000 of the absorbed solar flux. But if the present rate of growth continued for 250 years emissions would reach 100% of the absorbed solar flux. The resulting increase in the earth's temperature would be about 50° C. - a condition totally unsuitable for human habitation."[2]

Now it may seem a rather broad jump from Colstrip Units 3 and 4 to global thermal pollution, from 1976 or 1985 to 2220.[3] The point is that the same logic of exponentially increasing demand which leads to one leads to the other. Disaster is not imminent. But it is in the long-term inescapable so long as our decisions continue to be guided solely or primarily by demand curves which have an exponential character.

Until relatively recently, the consequences of non-stop economic growth, and the corollary development of technology and demand for energy on which it depends, were not clear. But we are now beginning to grasp the outlines of the future. We are beginning to realize that we are running a race which, barring totally unforeseen technological developments, we cannot win. The alternative is to reject exponential demand as the determining factor in energy policy. To do so is not to abandon technology or an energy-intensive civilization or to take to the woods; the alternatives are never as stark as either the power companies or the ecological movement likes to paint them. It is to bring technology and consequently our future under some sort of control, to consider demand in relation to the energy levels which are in the long term possible on this planet and in relation to real human needs. It is the great responsibility of the Board of Natural Resources to question the logic of demand, to put it in a long-range perspective, and to help chart the course of a rational future.

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[1] Lifestyle and Energy Consumption; Scenarios for the Year 1985, 2000 and 2025.

[2] Quoted by R. L. Heilbronner, The Human Prospect (New York, 1974), p. 51. Heilbronner points out that although the use of solar energy would add nothing to the heat of the atmosphere, it follows from the Ayres-Kneese figures that even "a complete capture of all sunlight falling on the earth would yield no more energy than 250 years of growth of conventional (including nuclear) sources."

[3] In fact, the effects of heat dissipation alone if we continue along our present course will be felt far earlier.

HEARINGS EXAMINER: You may cross-examine, Mr. Bellingham.

EXAMINATION OF DR. GORDON G. BRITTAN, JR.

Cross, by Applicants

By Mr. Bellingham:

Q How old are you, sir?

A I'm 36.

Q Have you had any experience as far as load forecasting is concerned?

A I've had no experience as far as load forecasting is concerned, and I'm not an expert on energy policy; but I could add that as a logician, I've studied the elementary theory of such forecasting. And, furthermore, as a logician, I take it that my basic job is to examine the argument that other people put forward to draw consequences from premises that others advance and try to establish and to try to eliminate the underlying assumptions of any given argument.

Q You have had no practical experience, however, in --

A I have had no practical experience in energy forecasting.

Q Now, you state on page 1 that the applicants' case for the building of Colstrip units 3 and 4, rests almost entirely on the projection of demand for electricity in the Northwest; do you not?

A Yes, I do.

Q Are you familiar with the exhibits that have been introduced in this case?

A I'm not familiar with the exhibits that have been introduced in the subsequent hearings. That claim is based on Section 1.3 of Impact Statement prepared by the -- prepared by and for the power companies' objectives of the proposed facility.

Q That's the Westinghouse statement, is it not?

A Yes, it is.

Q Do you remember the date of that Environmental Analysis?

A Well, I --

MR. GRAYBILL: For what purpose do you ask him to remember the date of your Westinghouse Analysis; are you testing his memory, or his reading the whole book; is that the purpose, Mr. Bellingham? Would you like me to go and get it so he can look it up, Mr. Bellingham?

MR. BELLINGHAM: I know what it is, Mr. Graybill.

MR. GRAYBILL: Then, what's the purpose of the question?

MR. BELLINGHAM: I appreciate your concern. Reference has been made to the Westinghouse Analysis, and I want to put it in the proper context of time, is all.

MR. GRAYBILL: Well, then, why don't you tell him the date.

MR. BELLINGHAM: I've asked him the date.

HEARINGS EXAMINER: You may answer.

A In fact, I don't know what the date is. Although, since the initial figures in Table 1.3-1 are 1973-74; I would guess that the Impact Statement was prepared in that time frame.

Q Have you supplemented your information that you've obtained from the Westinghouse Report by looking at any further details of forecasts, as far as these applicants are concerned?

A I have not; but let me add that it seems to me that the basic point that I want to make is a very simple one, and that is that as long as we continue to base our arguments for the creation of additional generating capacity in this country on demand forecasts with an exponential character, then we will compound over the long range our problems. If these projections have been scaled down, then so much the better, perhaps to that extentity, the case for 3 and 4 has been weakened. But even if these projections have been scaled down, as long as they retain their exponential character, it seems to me we still face the kinds of long-term consequences I discuss in my statement.

Q What kind of forecasting should be done, then?

A That kind of forecasting should be done. There's nothing wrong with the forecasting. The -- what has to be done is to take that forecasting into account, and then ask ourselves the question: If we build additional generating capacity to meet those forecasts, what are some of the other consequences we can expect; and that's what I've tried to do. There's no better way to forecast the situation; but once we have those forecasts in hand, then we ask ourselves, what are the long-range consequences of these forecasts. And if we think those consequences are undesirable, then we take steps to scale down demand.

Q Now, you're against the exponential method of forecasting, is that right?

A I'm not against the exponential method of forecasting; I find no reason to argue with the method of forecasting. I think

I'm acquainted with the theory of it and find no fault with it. The problem is that if we forecast in this way and we use that forecast as a premise in an argument that we must continue to build generating capacity at that same rate, then we're going over the long-term to face real difficulties; that's all.

Q Have you analyzed the Montana Power method of forecasting?

A I've not analyzed it in any detail; but, again, I've got no quarrel with the method of forecasting.

Q Have you analyzed Puget Sound Power & Light method of forecasting.

A I have not analyzed the method of forecasting other than to look at the table, which included the Westinghouse Impact Statement.

Q As a practical matter, you haven't analyzed any method of forecasting utilized or used by any of the five applicants in this case?

A No, but I have no quarrel to make with the method of forecasting.

Q Let's go back to the Westinghouse Report. I think the date on that is November of 1973. And I would like to call your attention that there have been exhibits relative to the forecast demand of the five applicant companies that have been introduced into evidence; you're not aware of those?

A I'm not aware of those. May I ask you if the logic of those forecasts is basically the same; that is, demand is forecast -- the rate of increase is forecast on an exponential basis? That's really the only point that I want to make.

Q At the bottom of page 3 and the top of page 4 you indicate, "It is to bring technology and consequently our future under some sort of control, to consider demand in relation to the energy levels which are in the long term possible on this planet and in relation to real human needs." Now, calling your attention to, "to bring technology and consequently our future under some sort of control," what do you mean by that?

A What I mean by that is to make decisions on the basis of what in particular -- what energy levels in particular this planet can afford over the long term, and not simply to increase generating capacity on the basis of projection of past demand.

Q Well, how would you propose to bring it under some sort of control?

A I think the first thing that has to be done is to curb demand. And several studies that have appeared in the last year, notably the Ford Foundation's Project Energy, and the Ford administration's Project Independence Team Report, indicate that we could cut in half the demand for energy in this country. That is to say, from 4.5 percent annually to 2 percent annually, without seriously affecting the rate of economic growth. My own belief is that in the long term, we'll have to dampen demand more than that. The method of demand proposed in these studies is the classical American one: the market and tax incentives.

Q And you are familiar, of course, that other experts disagree with that approach; do you not?

A I understand that this is a matter of controversy.

Q We talk in here about long term solutions, I think somewhere, do you not?

A Yes.

Q You are aware, of course, that the federal government has increased its research for more efficient effective energy systems, as far as the long range is concerned?

A I am.

Q And, what type of resources are we talking about?

A Over the very long term, it seems to me we're talking principally about nuclear fusion, as Hans Bechta, the Nobel laureate from Cornell points out in the January, 1976 issue of the Scientific American, fusion is 21st century at best kind of possibility. But it seems to me our long range hope is in fusion.

Q What about others?

A Solar, again, I must say that I'm not an expert on energy. I try to inform myself on the basis of reading these basic reports that have been issued. Solar appears to be a satisfactory solution to the problem of home heating and cooling in a relatively short period. Present costs indicate that solar is not a near term future for generation of electrical energy.

Q When we talk about near term, what are you talking about?

A I'm talking about the period between 1985 and approximately 2025.

Q And what about magnetohydrodynamics; do you see a future in that?

A Yes. I think one of the things that has to be emphasized in connection with conservation. The conservation effort that could be taken in this country is increased efficiency in energy conversion. The present technologies, which convert coal to electricity, are not highly efficient and MHD would increase that efficiency and is, therefore, to be desired.

Q And that, of course, is another long term hope, is it not?

A Yes, but not nearly as -- I'd say it's medium long. It's in a different time frame than the development of fusion power, for example.

Q You don't expect any practical application of MHD until certainly after 1985 or later, do you?

A No.

MR. BELLINGHAM: I have no further questions.

HEARINGS EXAMINER: Mr. Graybill.

Redirect, by Northern Plains Resource Council

By Mr. Graybill:

Q Mr. Brittan, what do you mean by exponential demand?

A I mean demand which increases at a constant rate and which, according to a relatively simple formula, will double over a given number of years; for example, if the rate is at 8 percent and we can expect it doubling in approximately 9 to 10 years. If, to use these figures on energy growth that I quoted a moment ago, we continue to demand energy at 4.5 percent, then in 15 years we'll have a doubling. If we can reduce that demand to 2 percent, the doubling will take 35 years. It seems to me we should maximize our lead time. But any constant rate of increase which has the effect of doubling the total amount in any given number of years is what I mean by exponential increase or demand.

Q Does, from your experience, does nature and does reality follow an exponential rate?

A So far it's been our experience that the resources in this planet are finite and they certainly don't increase at any exponential way; and we thought for a long time, I think, that our technology increased in an exponential way and that would make up for the fact that nature was not increasingly more abundant. I think now we're beginning to have second thoughts about that.

Q You point out in your paper that the applicants here base their need on demand; what is the difference between the concept of demand and the concept of need?

A It seems to me that demand is a function entirely of the rate at which people want or perhaps would use, in this case, electricity. Need has to do with a variety of other considerations, philosophical considerations in part, as my colleagues pointed out, among which are a satisfactory way of life, what level of energy is needed to provide enough food, enough shelter, enough clothing, what human beings need in a way of personal comfort, or perhaps even an occasional luxury. Demand takes none of these considerations into account; it's a much narrower concept; it's based entirely on use.

Q But it's a concept which quantitatively is a maximum, isn't that the idea? In other words, demand implies, does it not, that everything that can possibly be absorbed or satiated?

A Right. Typically the demand figure is much higher than what, I think, any reasonable person would say is the need figure.

Q Have you read the Utility Siting Act enough to know whether it's based on -- whether the Board's decision here is enjoined by the Siting Act to be based on demand or on need?

A The word used throughout the Utility Siting Act is need; and the kind of explanation that's given, for example, in Section 2, indicates that it's that wider human concept rather than the narrower statistical concept which is at stake.

Q Is there any philosophical description or explanation of a phenomenon known as demand begotting demand; in other words, does the fact that you raise the demand in itself create additional demand?

A In certain kinds of cases -- is demand self-generating in certain areas?

Q Yes.

A I think that it is. In certain areas of our technology, perhaps in certain sections of our agriculture, perhaps in connection with some of the appliances; for example, air conditioning that we use in our homes, demand has generated more demand. That is to say, increased use of energy has necessitated use of more energy has necessitated use of still more energy.

Q Do you know from any knowledge of yours, either general or specific, whether or not that isn't in fact the case, for example, in the mining of coal; doesn't it take much larger sums of energy to mine coal than it did to create other types of energy, for example?

A I don't, in fact, know that.

Q So I take it the thrust of your statement, then, is that one of the duties you see enjoined by the statute on the Board here, is to examine whether this steady exponential demand type growth is, in fact, needed or is, in fact, the test by which the statute is to be applied?

A That and the fact that I've tried to look at what I took to be the center of the power company case and try to place it in some sort of long term perspective, as I think the wording of the Act invites putting these kinds of issues -- and I take this issue to be crucial -- in some sort of long range perspective. We're all in this boat together; it shouldn't be an adversary situation. We're faced with a real energy problem in this world, and I think that some eye on the long range implications of our present Act is necessary if we're going to reach some sort of rational decision.

Q Let's take Mr. Bellingham's favorite device here and assume for a minute that an exponential increase in demand is going to be necessary at let's say a fairly high rate of say 6 or 7 percent for the next few years; and let's further apply to that the testimony that we've had from a number of the companys' expert witnesses, namely that they have an extremely difficult time predicting beyond 5 years, and certainly don't want to predict beyond 10 years. What happens to the exponential theory and to the demand type basis of their case if they combine these two; that is, an exponential rate of growth and yet an inability to foresee beyond 5 or 10 years?

MR. BELLINGHAM: How do you pronounce that word, Leo?

MR. GRAYBILL: Well, you pronounce it for me. I'm probably putting a "t" when I shouldn't.

HEARINGS EXAMINER: Growth -- g-r-o-w-t-h.

MR. GRAYBILL: What is the correct pronunciation, Mr. Bellingham?

MR. BELLINGHAM: Exponential.

Q To rephrase that question, then, what I'm saying is that, assuming with Mr. Bellingham that we're going to have an exponential increase in the use of power for some period, but assuming with his experts that they can't see beyond 5 years, what does that do to the theory of their case?

MR. BELLINGHAM: We object to this on the grounds that it assumes evidence not in this hearing, that has not been introduced.

MR. GRAYBILL: You mean to say that your experts haven't said that they had difficulty predicting beyond 5 and don't want to predict beyond 10?

MR. BELLINGHAM: I think you made it a lot stronger than that.

HEARINGS EXAMINER: Alright, it's overruled. You can answer and you can assume and see what you come up with.

A It seems to be a logical contradiction. I might add this, anybody who knows anything about the theory of forecasting in uncertainty conditions, knows how difficult it is to forecast over any period of time. But it seems to me the paradox that is faced here is the following: Certainly it could be conceded that we'll need additional generating capacity in this state some time in the future. There doesn't seem to be any question about that. But the building of 3 and 4, which is a massive increase in generating capacity in this state, seems necessitated by these demand figures, which show this rate of increase of 4-5-6-7, in some cases, some areas in the Northwest, 8 percent or better than that. We need that -- it seems to me that the company case rests on that kind of exponential increase, the case for 3 and 4 specifically. On the other hand, if we admit that growth isn't increasing at that rate or we admit that it's difficult to justify any forecast of this kind over, let's say a 4 or 5 year period, then the case is weakened.

Q Are you aware that 3 and 4 more than doubles the amount of electrical energy being produced in the state of Montana now?

A I am aware of that.

Q And if you add 1 and 2 in, that the rate becomes something like tripled or nearly quadrupled the present production of power in the state of Montana?

A Right, and if you were to extend that curve for any point of time, you'd see that it would be heading straight up.

Q We would be putting all of our resources into power?

A Yes.

Q If we put all our resources into generating power, we wouldn't have much time to use it, would we?

A That would seem to be the case.

MR. GRAYBILL: I have no further questions. Maybe Mr. Bellingham has.

Re-cross, by Applicants

By Mr. Bellingham:

Q You say that 1 and 2 will do what to our production of energy in this state?

A If we add 3 and 4, we're going to vastly increase the generating capacity in this state.

Q But you used a figure; did you say it would double?

A That was Mr. Graybill's figure.

Q Yes, but you agreed with it, didn't you?

A Yes, I did.

MR. GRAYBILL: Well, you've misstated me, Mr. Bellingham. I said that 3 and 4 would more than double and that if you added 1 and 2 to 3 and 4, you would triple or nearly quadruple.

WITNESS: Those are the figures I am agreeing with.

Q Alright. What figures are those based upon; do you know what the present production of energy in this state is?

A No, I don't, specifically; but I know what the capacity of 1, 2, 3 and 4 is, and I'm familiar with that figure, the increase that that would mean for the state.

Q What is the total capacity of 1, 2, 3 and 4?

A It is approximately 2100 megawatts.

Q Do you know what the total output in this state, production is?

A At the present time?

Q Yes.

A Without 1 and 2?

Q Yes.

A I think it's on the order of 500 megawatts.

Q By whom? Five hundred megawatts at present, is that right?

A I don't know that for a fact; I'm just working backwards.

Q You made that statement, didn't you, that you thought it was about 500 megawatts being produced in this state at present?

A Yes.

Q By all the generating units in this state, is that right?

A Yes.

Q That would include Montana Power, that would include Washington Water Power, if they had generation, it would include the Bureau of Reclamation, all others?

A Right, I'd have to revise the statement to take all of those into consideration.

Q Well, it's a fact you don't know, do you.

A I do not know exactly what the generating capacity is at the present time.

Q Are you sure that 1 and 2 will double the generating power of this state?

MR. GRAYBILL: To which I object. It is an attempt, apparently, by a smart lawyer to confuse the witness, because neither he nor I have said that; and so you are assuming stated facts not in record. I said 3 and 4 would double the Montana Power's capacity, Mr. Bellingham. And if you want to use that, fine, but I don't want you to try and confuse the witness.

MR. BELLINGHAM: I'm not trying to confuse him at all.

MR. GRAYBILL: I don't want you to try and confuse the record either, then.

MR. BELLINGHAM: Well, I think you're trying to confuse me, Mr. Graybill.

MR. GRAYBILL: Let me give you that again, Mr. Bellingham. Three and four --

HEARINGS EXAMINER: Alright, that's repetition. We won't have any more of that; we've gone on long enough. We've got a lot of people here who I think would rather hear the witnesses than the lawyers. Ask your next question.

Q In your analysis, did you, and in your figure of 500 megawatts, did you include other companies besides Montana Power?

A No, in the generation of power in the state, no.

Q Are you sure of that?

A I'm positive. But let me just add this: My case, as I've tried to make it in response to questions, doesn't depend on how much power is presently being generated or by Montana Power Company or any federations of companies in the state or in the Northwest. It just rests on one single, simple point, and that is that the case for increased generating capacity rests on a particular kind of projection of demand; and all I want to do is point out the long-range consequences of that kind of growth, that's all.

MR. BELLINGHAM: No further questions.

MR. GRAYBILL: That's all.

HEARINGS EXAMINER: Thank you, sir.

(WITNESS EXCUSED.)

HEARINGS EXAMINER: Next witness?

MR. GRAYBILL: We'll call Mr. Toole.

DR. K. ROSS TOOLE, called as a witness by the Northern Plains Resource Council, having been first duly sworn upon his oath, both as to his written direct testimony and as to the oral testimony to follow, was examined and testified as follows:

MR. GRAYBILL: Mr. Hearings Officer, before we start with the cross-examination of Mr. Toole, I'd like to make a couple of corrections. If those who have his statement will take page 1 of his statement and under subparagraph 2 in the middle of the page there, Arabic 2, there's a sentence that says, "Man did not study and hence did not understand that cyclical growth . ." It should be "that cyclical drought . ." Then on page 13, there's two little charts there: one called Gross Proceeds and the second one is called Percentage of Taxes Paid. Farming & livestock are one category and they go to the 42 percent; and then the next category, Railroads, goes to the 17.99 percent, and Others to the 30.35 percent. In other words, the bottom two categories should be dropped down a slot. And then on page 14, the second symbol on page 14 is $46,000, and it should be $46,000,000. The other day we put a million in when it was not supposed to be there; this time we left it out. I'd like to make those 3 changes in text of his statement. Then, I've had marked for identification, Northern Plains Resource Council Exhibit 16, a chart that accompanies

Mr. Toole's statement and illustrates it. In his text he refers to the chart as Appendix A, but I'm sure it would get lost if it were that designation, so I renumbered it as Proposed Exhibit 16, Mr. Bellingham. And now I would like Mr. Toole to be allowed to make a statement about his background and qualifications and years of teaching, and so forth. Could he start with a paragraph on that, Mr. Hearings Examiner?

HEARINGS EXAMINER: Yes, sir. Mr. Toole, or Dr. Toole, go ahead.

Oral Supplement to Written Direct Testimony

By Dr. K. Ross Toole:

Thank you. My name is K. Ross Toole. I am a professor of history at the University of Montana. My special field is history of the American West. My special special field is the history of Montana. I got my B.A. and M.A. at the University of Montana; my Ph.D. in Western History at the University of California. Thereafter I became the director of the Historical Society of Montana in Helena. I moved from there to be director of the Museum of the City of New York, which is a private institution, not a public institution. I moved from there to be the director of the Museum of New Mexico. I moved from there to the family cattle ranch near Red Lodge, Montana, where I ran the ranch for seven years. I then had a coronary and I was advised to seek a healthier climate, and became a professor. I was unaware at the time that I could get into all kinds of trouble, but so be it.

MR. GRAYBILL: Alright, Mr. Bellingham.

(THE WRITTEN DIRECT TESTIMONY OF DR. K. ROSS TOOLE WAS DIRECTED TO BE INSERTED AT THIS POINT.)

STATE OF MONTANA
BEFORE THE BOARD OF
NATURAL RESOURCES AND CONSERVATION

STATEMENT OF
K. ROSS TOOLE

Probably no region in America has been so mercilessly and repeatedly misunderstood as the Great Plains. Man has almost always overestimated or underestimated this large region. The result has often been great suffering for man and much destruction of a rich and fragile land.

At the core of periodic tragedies lie two interrelated facts:

1. Laws pertaining to the disposal and use of the public domain on the Great Plains have been passed by an Eastern-oriented Congress which utterly failed to understand the inherent nature of this land;
2. Man did not study and hence did not understand that cyclical ~~growth~~ drought of fierce intensity was (and is) an inherent characteristic of the Plains and not an aberrant, rare visitor. (See Appendix A)

This latter fact (to which I will advert again) led man grossly to miscalculate water flow in the plains rivers and the availability of subsurface water. That tragic miscalculation is very much a part of the picture today.

It may well be that with 12" to 15" of precipitation, reclamation is possible. But turn your attention to Exhibit A. This precipitation "pattern" extends only from 1878 to 1949. But climatologists are now able to push this pattern back at least to the 17th Century,and current research indicates that the pattern has existed for thousands of years.

In short, the plains are subject to regular cycles of viciously intense drought, swinging from wet to dry roughly on a 20-to-25-year cycle. The wet cycle (not shown on this chart) has been with us now for some 26 years. On this basis, listen to the testimony of several of America's most prestigious climatologists.

As early as 1938, Charles Greeley Abbot, in considering the awesome destruction of the "dust bowl drought," said, "Rest assured, it will come again - beginning about 1975." Abbott was then Secretary of the Smithsonian Institution. Says Dr. Walter Orr Roberts, Director of the Center for Atmospheric Research, University of Colorad, "There have been something like eight successive, serious, dry periods, spread approximately twenty to twenty-three years apart (on the Plains). When I see a repetition that has carried on for that mary cycles, I always suspect there must be some fundamental cause for it."

Meteorologist Dr. Harry Geise of Sacramento agrees, and like many meteorologists, believes the cycles are closely connected to regularly cyclical sun spot eruptions.

J. Murray Mitchell, Jr., a prestigious climatologist with the Government's Environmental Data Service, contends that the true "disaster" droughts occur on about a 46-year cycle, with interspersing "less intense droughts" on the 20-to-25-year cycle.

Donald L. Gilman, Chief of the National Weather Service's long-range prediction group, said baldly, in 1974: "People making plans on the basis of the weather experience over the last decade or two could be in for a real shock." (emphasis mine.) And Gilman went on to predict a serious drought in the near future.

What has all this to do with stripmining and Colstrip Units 3 and 4? It is fundamentally related to reclamation and to the transferral of water from agricultural to industrial purposes. Eastern Montana does not, as the Montana Power Company has claimed in its advertising, average 12" of precipitation per year. The Yellowstone River does not average a flow of 8.8 million acre feet per year at Sidney, Montana. Or, if by the manipulation of figures, man can average out extremeties, seeds cannot, water cannot, and soil cannot.

Scrutinize Exhibit A again. Look at the 24 years between 1881 and 1904. Can anyone seriously assert that domestic seeds (without massive irrigation) could sprout and flourish with annual precipitation in the range from 6" to 4"?

Look at the period from 1917 to 1939. Can anyone seriously talk about reclamation in the precipitation scale of 2.4" to 5"?

But, you may say, what of the pre-agricultural period? The answer is that that conglomeration of plants known as "native grass" had (over thousands of years) adapted to the wild extremities in precipitation. The seeds were what old-time ranchers called "smart seeds." They did not sprout to be seared off. They lay dormant until the wet cycle came again.

Have soil scientists "invented" any drought-resistant plant life that can survive in the range of 2.4" to 4.2" of precipitation, with humidity at roughly 4% (as it was in much of the period from 1917 to 1939), and with wind velocities a rather constant 20 to 30 miles per hour? Rumors to the contrary notwithstanding, they most certainly have not.

Please now again examine Exhibit A and consider the wet period 1905-1916, during which precipitation was "excess" by 26.79" with only a deficit of 1.54" - with rainfall for the whole period of 25.7% above average. This period is startlingly similar to the period 1950-1975. But mark this: The period (wet) from 1905 to 1916 being thought "mormal" resulted in terrible trauma and suffering for man and animals; it ravaged the land, it came near to bankrupting Montana.

I shall narrate briefly what happened. But it is vital to bear in mind that the root causes of what happened were a misunderstanding of the nature of this land by an Eastern-oriented Congress; a misunderstanding of the land by those who were attracted to it by the laws passed by that Congress.

The old Homestead Act of 1862, granting 160 acres of free land to any settler who would establish a farm, was a crashing failure in all of the semi-arid West. This has been so abundantly documented by historians that I can only refer the Board to a bibliography which would constitute hundreds of books and articles.

But that Act was followed by dozens of others: The Desert Land Act of 1877; the Timber and Stone Act of 1878; the Free Timber Act of 1877; a host of absurd reclamation acts; and then the big one, the Enlarged Homestead Act of 1909, which granted 320 acres of free land instead of 160.

To farmers (and others) in the humid, deep-loam areas of the Middle West, the South, and New England, this was an enormous bonanza. Because where they lived, 320 acres was a very large and rich farm. Aided and abetted by massive railroad "colonization programs," by all manner of Western booster groups, by high wheat prices, by the "development departments" of Western states (particularly Montana) - the flood began. Beginning about 1909 and extending into 1917, about 80,000 people inundated eastern Montana. They created about 100 new towns; they created 23 new counties. In 1900, there were 7,000 farm-ranches in eastern Montana. By 1920, there were 46,000 farms.

In 1916 alone, the Northern Pacific Railroad sold 1,313,472 acres to the homesteaders. Between 1910 and 1922, the homesteaders had taken up over 40% of the entire area of Montana (Montana consists of 93,000,000 acres).

Look at it another way: In 1909, only 250,000 acres in Montana were planted in wheat; by 1919, 3,500,000 acres were planted in wheat. It was a great, great boom. It meant people, progress, jobs, a new tax base. It meant prosperity - and indeed it did!

Please refer now to Exhibit A and look at the period 1917-1939. The cycle had come - the old, reliable drought cycle. Let us see what it did to men and land - and to growth and the tax base.

In the face of the intensity of this drought, 60,000 people of the 80,000 who had flooded in, now flood out. They were destitute, hungry, ruined. I will not dwell on their own intense suffering. But let me suggest the economic consequences, because in our present affluence in Montana (yes, affluence), we have forgotten!

About 100 thriving towns became ghost towns. The average value of all farmland in Montana was cut precisely in half by 1925 (tax base, jobs?). Farm mortgage indebtedness reached $175,000,000. County land ownership increased nearly 5,000 percent; the actual drop in the valuation of farmland by 1922 was $320,000,000. Over-all county expenditures rose 587 percent.

Taxes per farm rose 140 percent in three years, 1920-1923.

Two hundred and fourteen banks failed - more banks than we have in Montana today. Eleven thousand farms vanished completely, blown on the edge of a hot, gray wind off to the east of Kansas. An S & S study done in 1965 noted that roughly 2,000,000 acres were completely denuded. While I do not have space or time to review that report, it may be worth saying in passing that recovery in terms of erosion has been painfully slow. Data pertaining to that one single period indicates that in approximately two thirds of the eastern counties, land erosion is still moderate to severe.

It seems to me that my testimony may be legitimately challenged on the basis of the fact that I am taking one incident, admittedly tragic, and that I am endeavoring on the basis of that one incident to generalize unconscionably with respect to another boom (and bust), stripmining (which I do not oppose in totality at all) and the potential disaster implicit (rather than explicit) in a coal and mine-mouth generating boom. Unhappily, I think, such is not the case. Because the fact is that the boom-bust pattern in our history is by no means confined to this singularly tragic era. It is, in fact, the single most characteristic pattern in the history of our State. It began in the 1820's and it has not ended yet. If that pattern, to any alert historian, jumps out at him irrefutably, he can only be saddened by what is happening to us again and today.

The justifications for the booms have almost always been the same: Jobs, growth, prosperity. In the 1880's and the cattle boom; in the 1909-1920 period and the homesteader boom; the era of enormous copper production, 1884-1955 - the arguments for the chimeras have always been the same. Even the words are the same, the brochures, pamphlets, the adjurations, the "testimony," the "studies," and the legislative debates have been the same - jobs, prosperity, growth, tax base, and economic good health for our State. But it has simply never happened. Why? Because we have not understood the nature of our land and - shockingly - still don't.

Refer again, please, to Exhibit A and to that section labeled 1881-1904. Note the drought pattern and now attend to another erroneous "boom" and awesome "bust."

Montana had the finest, hard-finish, high-protein "native grass" in all of the West. Though complex, I must confine myself to the essentials of what happened.

In the 1870's population in Oregon and Washington had stabilized. They had, therefore, a surplus of cattle. They drove these cattle eastward onto the incredibly rich eastern Montana ranges. In Southern California and in Texas, a deep drought in the 1870's and 1880's led to great trail drives up to the rich, high-protein, Montana grasses. By 1886, there were approximately 800,000 to 1,000,000 cattle on the eastern Montana ranges. Also, because of the dessication and droughtridden ranges to our south, sheep were being driven in huge numbers - northward to our richly endowed native grass ranges.

Even though our own ranges were now beginning to be afflicted with drought, this was public domain - and no one could stop the influx. Native Montana ranchers were both frightened and horrified. Yet the Territorial Government, always conscious of the "tax base" and "prosperity," greatly and skillfully encouraged the "newcomers."

Since this was federally-owned land, public domain, there was very little that knowledgeable MOntanans could do about it - though a dedicated few tried terribly hard.

But the profit was enormous because the land was federally owned. The money which placed these cattle and sheep on our eastern ranges was not Montana money at all. It came from Scotland, England, Boston and New York. Overwhelmingly so. (See a close analysis of this financing by Eugene Gresley in a classic book entitled Bankers and Cattlemen.)

So, by the millions, they came to our incredibly rich ranges in Montana. And so by the millions, they grazed it down to the roots. Now go back to Exhibit A, 1881-1904, and look again. From a wet cycle (which only shows here in the period 1878-1880, but which was actually a wet period of about 25 years, we move into a serious drought period beginning in 1881. The fact is, that so rich and remarkable was this native grass range, we did not hit the disaster until 1886-1887. Notice that the "killer years" in this period are only two. Count over from left to right, however, and you will see the nature of the disaster. Much has been written about the hard winter of 1886-1887. Indeed, Western historians mark that winter as "the end of the open range." But contemporary sources mark it much more accurately: Gross overgrazing, yes. But, above all, drought. Moving up from South to North, it had hit us. On schedule! Check Exhibit A again, and the period 1878 to 1880, which was, in fact, about 1865-1880.

The result. Please read this with some care. In the hard winter of 1886-1887, roughly 75% of all the cattle on Eastern Montana ranges were dead, piled up in gulches and coulees, they were dead by March, 1887.

Montanans went down with their outside financiers. But they went down differently. The bankers in Scotland, England, Boston and New York could and did absorb the loss rather easily. Montanans could not - and so, there occurred wholesale bankruptcy and great suffering. Why, they asked, when we had the greatest natural resource in Northwestern America, are we now destitute? A good question then; a good question today. The answer: Because they, the MOntanans, could not control that resource (though they tried hard, very hard), but failed. It was, again, myopic federal policy hwich led to this catastrophe.

And the land, perhaps a word about the land. Did it recover? It did not. And here we must come to evidence. And it appalls me, given the short notice that I have been granted for this hearing, that I should be required to provide it. Yet I think I should. One problem is that I must not only refer you to truly classical, historical works on the Great Plains, but must also provide you with literally hundreds of scholarly articles involving thousands of pages. But if you will give me the time, I will assuredly do so, if you wish.

Now I have dealt with only two of the great booms and busts of Montana's history. And, again, you can legitimately say, but what has that to do with Colstrip 3 and 4? I could, it is true, go back to the great fur trade era - and demonstrate that the American Fur Company - in the name of jobs, prosperity, taxes and affluence, told us (Montanans) that there was in the trapping industry, 100 years of resources in the MOntana area -- and that we would benefit tremendously from this enterprise. Ten years later, all the beaver were gone - and all MOntana got out of it was a debauched Indian people - a people decimated by Small Pox and whiskey; a people destroyed; a people who now ask us why. They, the poorest of the poor, and the most ill, the most degraded - and they ash why. I wonder if the Board of Natural Resources has an answer.

But still the interlocutor must ask me, what has all this history got to do with today, Colstrip 3 and 4, and the energy crisis? He probably will not, because he cannot admit to the pattern which I assert herewith. He really cannot permit me to say what, in fact, is true. What is true is this: In no essential respect does the raid now on our natural resources differ from the same raids extending over a period of 156 year.

But he _must_ say that technology has changed all that. It can't happen again. And we need the jobs, the tax base, the money. And I _must_ reply: "Since your self same argument has _always_ led to our misery, destruction and sadness, the burden of proof that it shall be otherwise must rest totally with you - and not with us. And I _must_ say that you have no proof at all.

It goes beyond that: We in Montana had _vast_ wealth in copper. We mined it as much with the corruption of our political and judicial systems as we did with shovels and dynamite. And as for jobs and tax bases, let us consider what MOntanans really got. Yes, they got jobs. But it would be an extraordinarily naive and historically ignorant Montanan who did not know that we paid for those jobs with the complete abdication of a free government and free press.

But let us be more practical (if practicality has truly come to mean this awesome cynicism concerning free people). Let us look at what Montanans kept of their own vast wealth in terms of copper (and, secondarily, silver).

Again, the limitation of space and time precludes a detailed study (but if the Board wishes it, I will provide it). Let us examine just momentarily the vast largesse of the tax dollar.

I provide now only an example. I pick one period to exemplify all others. These are the figures.

Copper and Silver

Gross Proceeds, 1916

Mines	$141,500,000
Farming & Livestock	$135,352,150
Railroads	$ 60,199,998

Percentage of Taxes Paid

Mines	8.79%	
Farming	42.87%	
&		
Livestock	17.99%	
Railroads	30.35%	(small business and home owners)
Others		

Consider now, also, that as of this date, farmers and ranchers were already facing deficits and deep trouble. Yet, vis a vis mining, they were carrying 42.87% of the tax load as opposed to 8.7% for the mining sector.

Let it be said that if I have picked this one year as "unusual" merely to prove a point, I have not. You will find this ratio rather steady from 1889 to 1955.

Suppose, as we now have with coal, we then had a percentage of value tax. Roughly, since 1900, Montana had produced 14 billion dollars worth of copper and silver. If we had had, as we now have with coal, a 30 percent mine-mouth value tax on the market value of the copper, we would, over all these years, have realized

$46,000,000

about ~~$46,000~~ per year, or over 90 years, $4.2 billion, as a result.

We lost all that - and that is the real story of our economic history; it is sad, disgruntling, and somehow terribly wrong. But is is our history.

NOW, let it be said that on coal we now have a 30-percent-of-mine-mouth value tax. And that is splendid. We have learned something from history. Have we, really?

There are indications that we have not. Have we really calculated the dollar impact on the communities in the coal areas? Well, we have studies on both sides by the dozen. Please forgive my skepticism. In view of the history of our State's exploitation - a century and a half of it - and having had the totally rigged net proceeds tax since 1889, I can neither affirm nor deny that as an exporting region, we are "getting our money's worth."

I cannot do that nor, in fact, however clever he is, can my interlocutor. One reason is simple. I cannot answer these questions, nor can he. Neither of us can do so because of the "imponderables" involved. He, I think, must ask me questions of quantification. That is, in fact, all he can ask me. Indeed, I may not be able to answer them.

And yet, and yet, the real and awesome factors lie in the imponderables. Such as:

If you average out the annual flow of the Yellowstone River at 8.8 million acre feet per year, that is an average; what do you propose to do about the fact that in one dry year, the river flowed only slightly over 4 million acre feet that year (1961)? If you have already proposed the transfer from an agricultural to an industrial use (or in the MOntana - Wyoming Aqueduct Study (Federal) a minimum diversion of 2.6 million acre feet a year), what then of agriculture?

Montana's largest industry by far is agriculture -- about one billion dollars per year. It is, of cours, utterly dependent on water, surface and subsurface. The question which then arises is utterly vital: In simple quantative terms, is the trade-off a rational one? If you destroy, diminish or greatly shrink the water supply, that keeps our principal industry (food) alive and well, do we, as Montanans, benefit or suffer from a wide open lease and mining policy based on income from a 30 percent value on stripmined coal?

Moreover, if we benefit in the short run, do we benefit in the long? This is even more vital. It would not, you see, be an issue if all stripmined areas could be reclaimed. But that argument is much in contention. It dies not reside in whether or not reclamation can take place now (a wet cycle) - along with heavy fertilization and irrigation, it rather resides in the long run. Demonstration plots (a la Montana Power's) demonstrate absolutely nothing except for P.R. purposes. Unless, of course, reclamation proves feasible and economical without imported top soil, fertilization, and irrigation!

In the Fort Union area of Montana, of course, we are talking about dry land, not irrigated land. Moreover, we are talking about the inevitability of wet, drought, wet, drought, wet, drought.

So the question simply must arise: Does the short range 30 percent minemouth value tax on coal equal the long-range loss of agricultural production? Since the companies themselves have asserted that they can and intend to "mine us out" in 20 to 30 years, the ultimate calculations become all the more significant.

But, says the interlocutor, as he must, it seems to him that stripmining (concerning which, I assert again, I am not totally opposed) stripping aside, does not drought grossly reduce your primary industry, agriculture, in any event? The Answer, of course, is yes. Drastically yes, and hurtfully yes.

The argument then lies in how, and if, we recover. Consider now the examples of devastation I have given you: (1) 80,000 homesteaders came in; 60,000 fled. (2) The open range cattle industry was ruined by drought and speculation.

But if 20,000 of 80,000 homesteaders did not leave, then what secret did they have that others did not? If 75% of all cattle barons were ruined in 1886-1887, how about the 25% that hung on? Surely the cross examiner must ask me to deal with this. At least I hope he will.

The answers, however, are not easy. I shall, if he wishes, get very specific. But for now, permit me to generalize.

Though faced with the awesome nature of drought in its intense form, those who stayed and made it relied on an utterly basic commodity - ground water and wells and awesome toughness. But above all else, ground water, wells, and age-old springs. They ate porcupines, rattlesnakes and grasshoppers (true locusts - which usually accompany droughts). They picked off the legs and fried them. They grilled rattlesnakes and broiled porcupines. But they had, above all, wells. So they had gardens. Let me immediately here interject that coal was the aquifer they used; that ground water was held up within the distance from the surface which made pumps effective. Let me further interject at once that if the aquifer (coal) is removed, frightening scientific evidence exists that neither wells nor capillary action can bring subsurface water up to the level of utilization to the farmer. (See Wayne Van Voast's Research Reports.)

I do not for one moment deny that cyclical droughts do seriously damage agricultural enterprises severely in and on the Great Plains, per se. They cause awesome problems in Kansas, Nebraska, Iowa, etc. We have recovered from these cyclical catastrophes because while surface or river water dropped more than 50 percent, ground water, which responds much less quickly to drought, in effect, saved what was saveable. And, lastly, I must interject that in the whole Fort Union area (Saskatchewan, Eastern Montana, Western North Dakota, Northeastern Wyoming), the aquifer, or ground water holder and filter, is coal. I do not think this needs documentation, but, again, if the Board wants documentation, I shall provide same.

Still, the great and current questions remain. Can you, Toole, as an historian, equate our present problems with strip-mining and mine-mouth generating plants with all the patterns to which you have referred? Particularly, can you do so in the face of an undeniable energy crisis? Are you not now being myopic, parochial, selfish and self-centered?

I confess that in the writing of a new book, to be published by the Atlantic Monthly Press, about stripmining and coal, in mid-March, nothing has troubled me more. I am an American first and a Montanan second. I am an advocate of the free enterprise system. My philosophy is unalterably "capitalistic" - which is to say that insofar as our economic problems are going to be solved, they are much more apt to be solved in the private rather than the public sector. I want nothing to do with nationalization of our power and energy systems.

But I most seriously assert that we have extraordinarily viable alternatives to stripmining and mine-mouth generating plants on the Great Plains. I think we must use them.

It is true that in tonnage, 70% of the coal lies west of the Mississippi. But in terms of BTU's, which is all that matters, 55% of the coal lies east of the Mississippi. Much of it is low sulphur, it is close to the load centers, reclamation rarely poses a problem. Jobs in the coal areas are desperately needed. There would be little or no impaction on towns or facilities.

Permit me to make an emotional plea. Since we have for so long been so rich and so beautiful, and since our history has, in point of cold fact, been one of rapacious exploitation, let us now recognize that, all that notwithstanding, we are still rich - not only in beauty and the imponderables of space, beauty, life style, and things of the spirit, we are still rich in natural resources - one of which is coal.

Could not you, the Board of Natural Resources, grant all that - and then say, yes, we grant all that and we grant coal, which belongs to America as well as to us; what we insist is that this resource be balanced with and against a far more vital resource - food and fibre. So you may use our coal only in the context of much greater moment. Which is to say, cautiously, slowly, thoughtfully, and very scientifically. And you may not mine in the aluvial valleys.

We have, as a people, long had cause to be jaundiced and cynical. Let it no longer be this way. Let us recognize America's real needs. But let us never again submit to ripoffs, rape, and exploitation - short-range booms and long-range busts.

Based on our most earnest and serious consideration of proposals of the consortium and Colstrip 3 and 4, we find it to be in the age-old pattern - short-range profit, long-range devastation. Use our coal cautiously, yes. Do not sell out our heritage, our land and our people. Do not erect these gargantuan plants.

Do not, above all, fall for the age-old argument of jobs, progress, people and a tax base. For a century and a half we have fallen prey to that siren song - and been terribly hurt by it. You have, as a Board, the power to change that. God willing, you will. It will take great courage and much understanding of what Montana really is. I, along with many others deeply concerned, wish you well

EXAMINATION OF DR. K. ROSS TOOLE

Cross, by Applicants

By Mr. Bellingham:

Q Ross, or must I call you Doctor today?

A Please don't.

Q I haven't seen you in some time. Your hair is turned a little bit grayer. Mine hasn't, you understand, since I last saw you.

A It's hearings like this that does it.

Q Calling your attention to Appendix A, DNR Exhibit No. 16; now, you have set forth several hypotheses in your statement, have you not?

A I'd be a little careful about the word hypotheses; but for the sake of discussion, yes.

Q And these hypotheses, to a great extent, or conclusions, if that would more closely meet your terminology, are based to a great extent on this exhibit, DNR No. 16; is that right?

A Yes, with a qualification. As you see, this document was dated 1946; it is old; we are in the midst of preparing a document which pushes the left-hand side of the document that begins in 1878 back roughly back onto 500 years. We can't be quite as explicit as was this document in inches, so that the curve -- it will be a curve rather than the sharp ups and downs that you see here. That document is not yet prepared; I'm sorry that it isn't.

Q When you say "we," who do you mean?

A My graduate students, myself, in conjunction with several climatologists.

Q Now, this document is headed, The Influence of Rainfall on the Prosperity of Eastern Montana, by T. -- and I'm not sure of the name because it's rather obliterated in my --

A It's Lammason.

Q U. S. Forest Service?

A Yes.

Q And that was prepared in 19 --

A Forty-six.

Q Now, have you conferred with him?

A No, I have not.

Q Where did you obtain this chart?

A I obtained this chart from a member of the forestry school, who is a student of mine.

Q And when was this done?

A Oh, last year sometime.

Q And do you know where he obtained it?

A I believe he got it from Mr. Lammason.

Q Is Mr. Lammason living in Missoula?

A I can't answer that. I think he is -- this is conjecture -- part-time retired. I think he spends some time there, some time elsewhere. I'm not positive of that.

Q Do you know what his occupation was?

A He was a forester.

Q He was a forester. Was this with the U. S. Forest Service?

A Yes.

Q Do you know how many years?

A No, I don't.

Q And I think you indicated that you had not consulted with him relative to the chart?

A No, that's correct.

Q Do you know where he got his data for the chart?

A Yes, he got his data for the chart from various weather stations; he got his data for the chart from tree ring studies; he got his data for the chart from pollen studies, which are rather sophisticated. Where he had very accurate weather stations, he used them.

Q Now you say that he got them from various weather stations; do you know what weather stations he got them from?

A No, I don't. He mentions Havre; he took as accurate a sample as he could, according to the student who passed it on to me.

Q Well, when you say he obtained it from various weather stations, you've obtained this information from the student; is that right?

A Obtained the chart, yes.

Q But the fact that he relied, and when I say "he," I'm talking about the preparer of the chart, that he relied upon data from various weather stations; you obtained this information from the student also, is this correct?

A Yes. May I qualify that?

Q Yes.

A Since you are zeroing in on the chart, which I expected you to do, let me point out, if I may, that the climatologist, meteorologist and astrophysicist with whom I have consulted and who have examined the chart, testify to its accuracy.

Q Have you checked the accuracy of the chart yourself?

A No, I have not. I have relied on the climatologist, meteorologist and astrophysicist.

Q And who are these?

A Dr. Walter O. Roberts, principally, University of California -- or University of Colorado, rather; Dr. Harry Easy, Sacremento, University of California.

Q And do you know how they verified the chart?

A Yes, they verify it by a series of extraordinarily complicated, to me, at least, meteorological devices; pollen studies; tree ring studies; the relationship between what has happened on the Great Plains, in terms of cyclical drought and sun spots. They do not argue about the nature of the cycles; they argue among themselves about the cause, sometimes. There are some astrophysicists who don't relate it to sunspots, but rather to rise and fall of waters in the Great Lakes. As to the chart itself and its general nature, they do not disagree.

Q Well, we'll talk about the reasons for their conclusions later; but, I'm referring your attention to the average rainfall figures here. Do you know how they check these figures?

A They're checked, insofar as you can get, within the historic period; they are checked by weather stations and weather reports. Those are not, incidentally, terribly hard to come by. They are a little hard to come by in the earlier period, and, of course, impossible when you get to the prehistoric period.

Q Well, the U. S. Department of Commerce weather bureau prepares charts for these, do they not?

A Yes.

Q And you yourself have not checked DNR Exhibit 16 relative to the annual precipitation figures that are stated in there?

A No, I have checked only with the aforementioned climatologists.

Q Now, you talked about various weather stations. Prior to the time that we go into that, I notice that you indicated that the chart was prepared in 1946. Apparently somebody has brought it up to date, when I say up to date, at least to a later date, 1940 to 1948?

A Yes.

Q The right-hand column, second from the right, I should say, apparently has been done over and the figure 48 has been substituted for 46; is that right?

A Yes, that's my understanding of it.

Q And do you know who did that?

A Yes, my graduate student did that.

Q I see. And the column to the right, 1949 dash, has also apparently been added; is that right?

A That's correct.

Q And do you know --

A That's my graduate student.

Q Now, I think the graph is predicated upon the conclusion that the average rainfall from the year 1978 to 1946, a period of some 69 years --

A You mean 1878.

Q Excuse me, did I say 1978?

A Yes.

Q I'm sorry, 1878 to 1946, is 8.2 inches?

A Yes.

Q Now, that 8.2 inches is the average rainfall during this period of time, annually?

A No, it was the average rainfall during the growing season, defined as April through August; it's not annual, because if it were annual, you'd end up with something in the nature of 15.

Q Where on the chart does it indicate that it's only the growing season?

A On the left-hand side under the period 1878 to 1880, I think. "1878 to 1879, 1880 were all above average rainfall. In 1879 the highest pricipitation ever occurred to Miles City, the growing season, April through August. Such scanty records as are available" -- which he is admitting -- "show that the grass crops were excellent." That is what he's talking about; the growing season, August through April. Now, he does that elsewhere in here, Mr. Bellingham; we can go through it meticulously and find out, but that's what he's talking about. He's talking about the growing season, not annual pricipitation. Since annual precipitation, of course, doesn't mean anything, unless it comes at the right time, as you know; you can have 20 inches in snowfall, and if it's a chinook, which is very common, when there's a runoff on ice, it does the land no good. So he's concerned only with that critical period, the growing season.

Q That's April through August?

A That's right.

Q Well, that particular portion of the chart that you refer to, for the growing season, April through August, would indicate that it's only for that period of '78 to '80; and I off-hand --

A No, I don't think -- I don't agree with that. I think this is unevenly written; I think that he, obviously, not confining himself to 1878 to '80, but that he's using the growing season across the board, it wouldn't make any sense if he weren't; it's just not sensible.

Q And this is April through August?

A That's true. I have some cavil, personally, with the month of August, but I'm not going to go into it unless you want me to.

Q What do you mean by that?

A I think that the growing season, in terms of ranches, at least, has essentially ended by the end of July. You get some growth, but not a great deal.

Q As far as this precipitation that's indicated in the chart, DNR Exhibit 16, is concerned, what locality are we looking at?

A We're talking about Eastern Montana.

Q Well, are we talking about Eastern Montana as a whole or any specific?

A No, he's talking about Eastern Montana as a whole, you're going to get some peculiar results, obviously, here because Eastern Montana, within 20 to 30 miles of Beartooth Range, for instance, has a higher precipitation rate than Sidney. But, obviously, he's talking about Eastern Montana as a whole, simply because he says so, and that's on the title: Eastern Montana. I wish he had been more specific, but we're getting more specific.

Q Do you know what locality is embraced in Eastern Montana as a whole?

A I am assuming here that what he is talking about is east of the Divide; which, of course, I would have delineated more closely, but I did not do this at this time. I would have gotten away from the foothill region, because I think that distorts the figures upwards, not downwards.

Q When you say east of the Divide, what counties are you including?

A Oh, good heaven, Mr. Bellingham, I cannot name those counties. There's some 23 of them -- 24. As a historian, I should be able to name them county by county; I'm afraid I can't.

Q Well, I'm not asking you to name them but I'm asking you if you can, to picture approximately how much of the state is involved?

A Well, roughly, about two-thirds. That's rough. I have not broken it down into acreages. As a matter of fact, I don't have those figures in my head.

Q Do you know whether the U. S. Weather Bureau keeps records of monthly rainfall?

A Oh, I think so, Mr. Bellingham. I think so.

Q And, when they accumulate their totals, do they accumulate it on the basis of the yearly average or on the basis of the growing season?

A I cannot answer that. I would make an assumption, if you wish me to, that they would do so on the basis of a yearly average.

Q Now, when we're dealing with land managements, do you know, as far as the land managers are concerned, do they deal in figures of growing season precipitation only or on a yearly?

A Well, of course, the word "land management," Mr. Bellingham, would you define it please?

Q Well, perhaps we should say range management.

A Range management. I think that an alert -- let me say this, my own experience, and this is personal, varies. The very alert ones talk about the growing season; others talk about annual precipitation. I think that most people recognize that an annual precipitation figure is relatively meaningless.

Q What is the reason for that?

A I have already stated it, but I will restate it. That if you get very very heavy snowfall with a very very heavy water content, if you then get a chinook, if the ground is frozen, the water, obviously, flows into the streams, leaves the state, does not go into the land, and is of no value. So that a growing season figure actually, if you're talking about what we're talking about, reclamation, is a much more accurate figure to deal with or a much more viable figure to deal with than annual precipitation.

Q Don't we find that during the months immediately prior to the start of the growing season and the months immediately following the growing season, that we do get precipitation that sinks into the ground and can be utilized?

A You sometimes do, you sometimes don't. It depends, as you know. Our weather here is very quixotic. Our circumstances are quixotic; sometimes yes and sometimes no.

Q Well, for example, March, the latter part of March at least, and in September, moisture will generally sink into the ground during those months, won't it?

A It will generally sink into the ground and hopefully do some good, depending upon the nature of the ground. It is very much dependent upon the nature of the ground. I might add, Mr. Bellingham, that if I got two inches of rainfall in the Bitterroot Valley in September, I couldn't care less. The soil is such that it would be gone.

Q Where somebody in the eastern part of the state might well welcome it, is that right, depending on --

A Might very well, indeed. Generally never knock rainfall; accept it if it comes with great pleasure.

Q As far as the eastern Montana locality is concerned that you talked about as east of the Divide, as far as the old figures are concerned and the dependence upon the weather station, the only weather station he refers to in the early portion of the chart, that's from 1878 to 1880, he refers to Miles City, does he not?

A Yes.

Q Do you know of any other weather stations that he may have used?

A The presumption, and it's a presumption on my part, Mr. Bellingham, is that when you're dealing in 1878 to 1880, of course, if we're even lucky to have in Montana one weather station; as you progress up into the 1917, 1939, 1949-48 period, obviously, weather stations proliferate all over the place. Heavens only knows how many there are in that period -- hundreds.

Q Well, let's take the period 1881 to 1904, 24-year period; do you know what weather stations were relied upon?

A No, I do not.

Q Do you have any idea?

A No, I do not, sir. The assumption -- let me repeat -- at this period is in almost perfect concert with the astrophysical figures and those are based, during this period, on tree ring studies, plus, I might add, some pollen studies. Afterall, Ponderosa pine sometimes have a life of 300 years; it's a difficult technique to deduce rainfall, but it can be done with a relative degree of accuracy, and was done, and is still being done.

Q What about the period from 1905 to 1916; do you know what weather stations were utilized in that time?

A No, I do not.

Q What about the period 1917 to 1939?

A No, I do not.

Q And the period of 1940 to 1948?

A No, I do not. I would like to assert again, however, that the chart holds up admirably with the meteorologists, astrophysicists and climatologists.

Q Well, you don't know what weather stations were used?

A No, I do not.

Q What about the period from 1949 on?

A I can't answer you what weather stations were used; I'm sorry.

Q I take it, then, as far as your conclusions so far as the weather is concerned, this is based upon data that has been produced by others; is that right?

A Of course. I'm not a climatologist.

Q Now, I'm interested in your conclusions, hypothesis, whatever we want to talk about; you're basically saying here that the plains, on page 2 that's the way you analyze it, you call it the plains --

A Yes.

Q --"are subject to regular cycles of viciously intense drought, swinging from wet to dry roughly on a 20-to-25-year cycle."

A Yes, sir.

Q And that conclusions is not unique or new with you, is it?

A It certainly is not.

Q And you're relying here upon the studies and conclusions of others?

A I certainly am.

Q And you accept this, do you, this hypothesis of the cycles; regular cycles, 20 to 25 years?

A Yes, with certain reservations, which I should qualify. There is disagreement in terms of the following argument: There is a school of climatologists who believe that while the drought is roughly 20 to 23 years, roughly double that time or slightly over 30 years, you go into a much more intense drought of a dust bowl type. This is a current controversy; I presume that these gentlemen will settle the issue. They do not argue about the cyclical nature of the drought.

Q The question is, then, the extent of it?

A The question is the intensity of it, I think, not the extent.

Q What about the number of years in each cycle?

A I don't think that any climatologist would say on May 2nd, at 2 P.M., on April 3rd the drought will begin at such and such a place. Mr. Bellingham, drought is an enormously complicated phenomenon; we all oversimplify it. As you know, there is a very severe drought right now moving upward from the panhandle of Oklahoma. Drought is a phenomenon which involves interrelated factors. It will come -- it's a little like a volcano. There will be periodic minor interruptions before the main explosion. When you try to pin me down, if you try to pin me down on 23 years on the nose, neither I nor the climatologists believe that. They say roughly; were you to look at the span of time, roughly that is what happens. That is the nature of the cycle.

Q Believe me, I'm not attempting to pin you down to any month or specific time; but I am trying to obtain from you the difference in the climatologists as to the length of time involved in the cycles. You say that there is a difference of opinion?

A There is a difference of opinion as to there intensity. There is a school of thought that you get a real howler, vis-a-vis the dust bowl, roughly double the 20 to 23 year cycle. The other school of thought is, no, that's not really true; you're going to get about the same intensity every 23 -- 20 to 25 years.

Q But they all agree that the 20 to 25 year cycle is approximately it?

A That's correct.

Q Now, then, calling your attention to your DNR Exhibit 16 again, the period of 1881 to 1904 has been designated as 24-year period of drought; is that right, generally speaking?

A Generally speaking, yes.

Q The next period is 1905 to 1916?

A Twelve years.

Q Twelve years of relatively wet years?

A Yes, quite, as you can see.

Q That's a 12-year period?

A That's a 12-year period.

Q And then the next period is from 1917 to 1939, is 23 years of drought; is that right?

A Yes, sir.

Q And then from 1940 on, I take it from your testimony here, that we're talking about a wet period, are we?

A Generally we're talking about a wet period, although, as I'm sure you know, we have had some interspersing interruptions; 1961, for example, was a drought year. Generally, also, may I say, that this complex phenomenon arrived approximately on schedule, 23 to 25 years, in Texas northward into Oklahoma; that Montana clearly is overdue -- eastern Montana is overdue, I won't argue that point.

Q We have a period here of some 35 years?

A Yes.

Q Of relatively good moisture conditions?

A We do in eastern Montana, that is correct.

Q So we're lucky that we've not been involved in this cycle that you've testified to?

A We're lucky so far, only so far.

Q And you foresee that we're going to enter into a drought period in the not too distant future?

A Yes, sir.

Q And the reason for that?

A Well, must I be that repetitive? I will say that when you get a cycle and you have rather concrete evidence, if not very concrete evidence of long duration, that if you anticipate that something basic has changed and you're going to luck out or that it's not going to occur again, the weight of evidence would indicate the contrary.

Q Can you give us any idea when you expect this drought?

A No.

Q I'm speaking in general terms now.

A You know, I suspect -- we're certainly in the realm now of speculation -- I suspect it has started, Mr. Bellingham. I suspect that last week's Time magazine, which deals with the drought now burning up in Texas, is a rather typical pattern. It does not all settle down at once in the same time. I suspect that we are in the drought right now. The fact that it has not yet moved to the north; the fact that it has not yet siezed us, is, I think, beside the point. I think we're in it. But that is an opinion, and nothing more.

Q Speculation, isn't it?

A Of course it's speculation.

Q Well, let's confine ourselves here to eastern Montana. We are not in it right now, or do you think perhaps we are?

A No, I think we are not, yet. No.

Q Well, to get back to my question that I put some time ago; can you put any kind of a period when perhaps it might possibly start in eastern Montana?

A I just answered that, Mr. Bellingham. I said I think it -- oh, in eastern Montana?

Q Yes.

A No, do you want me to take an educated guess?

Q Yes.

A If it were to run as the previous droughts have run, it would, like cat cancer, metastasize in a period of 2 to 3 years.

Q Do you think within the next 2 or 3 years?

A Yes, sir. That's an opinion, but you asked me to speculate.

Q How long do you expect that to last?

A I would certainly expect it to last, with relief, because if you look at the chart before you, you will see that in drought periods -- let's take 1917 to 1939, look at a specific year, down below, if you wish, 1927; look at the relief you get. The problem is that that's only one year; and that adequate rainfall, adequate precipitation in the growing period during that one year is insufficient to cure the deep damage done by drought. This is not a thing that can be done year by year; it's not a thing that you can handle year by year. It simply has to be handled over a longer span of time. Notice, I might add, the period 1905 to 1916, notice that it's a wet period; but notice the year 1910. It is a very dry period; 1910 and 1911. But a rancher or a farmer can hold on and they did; and they held on very nicely for those two years.

Q I'm sorry, sir, I don't mean to repeat the question; but I think you did give us a number of years that you expected it to last, speculation?

A Please understand that you asked me to speculate and I speculated.

Q Right. And what was that?

A I say, 2 to 3 years.

Q That's when it starts; I'm talking about completion; how long it will last?

A Twenty-five, 23, 22, 18, 30; let's hope 2.

Q Well, you mentioned it before, and let's get into it. What is the reason for the so called cycle?

A There's an argument about it among the astrophysicists. The prevailing theory, that is to say, quantitatively, most astrophysicists have come to the conclusion that it is related to a period series of sunspot eruptions; there is a minor, lessor number of people who disagree and are seeking now and have been seeking for quite some time now, to relate it to a strange and inexplicable rise and fall in the waters of the Great Lakes. They do not know and cannot account for that rise and fall. They are dubious of the sunspot theory. But the preponderance of evidence leans towards the sunspot theory.

Q Those are the two only and the only two hypothesis that have been advanced?

A I wouldn't say that, because in order to say that, I would have had to consult every meteorologist, climatologist or person who had been studying this problem; which I have not done. They are numerous. May I explain something, Mr. Bellingham? They are not in the least interested in the Great Plains or reclamation. What they are interested in is improving their capacity for long-range weather prediction. If they have a base from which to work, which, in their estimation is the Great Plains, it is their hope that they can improve long-range weather prediction; which would be of vast benefit to this country.

Q Well, do you know of any other reasons that have been advanced?

A No, I do not. I am sure that there must be some, because for every effect, people will devise various causes, most of them bizarre. The people that I have talked to are the leading people in their field; and if I had endeavored to talk to all climatologists and all meteorologists, this would have been a hopeless task. None of the evidence that I have seen concerning this thing, indicates that there is any fundamental disagreement on this thing or other cause seriously set forth.

Q Other than the two that you mentioned?

A Yes. Of course, we all know that there is another theory; and that is that the whole damn thing is caused by the atomic bomb; but I would not care to speculate on that.

Q That would only take us back a few years, wouldn't it?

A Yes.

Q Maybe it had a retroactive effect, somehow?

A Who knows?

Q Well, would you term the cyclical sunspot eruption theory as bizarre?

A No. I don't think that you could take any man, any scientist of the prestigious nature, these people, and call their conclusions, after much much study, bizarre.

Q The rise and fall of the waters of the Great Lakes, would you term that bizarre?

A No, I would not term it bizarre; it has been very seriously studied.

Q Which of these theories do you, yourself, feel more inclined toward?

A Mr. Bellingham, don't force me into the position of being my own meteorologist, astrophysicist or climatologist. I would go with the preponderant view of the trade or of the discipline. I would go with the sunspot theory because it seems to be the more seriously taken by the people who are the experts in the field.

Q Well, can we carry it one step further; sunspot eruptions, what do we mean by that; just what are we talking about?

A Well, Mr. Bellingham, I think we all know that for reasons unknown, tension, I presume, builds up in the hydrogen on the sun. This tension reaches a point of breakover, and you get enormous flares reaching millions and millions of miles out into space of hydrogen; and that those flares inexplicably can part, although I think I may be doing it a service now, to the meteorologist in particular, are regular, rather regular; and have been noted since the 17th century, and have -- their regularity have been noted. You are getting me in a field where I claim no expertize, please understand stand. I just wish we had more sunshine this spring.

Q Well, what about water in the Great Lakes rise and fall; do you care to turn your attention to that?

A I certainly would not, because I have not, in detail, made any examination by those few who feel that they are somehow related; except one thing, Mr. Bellingham, they cannot account for the rise and fall of the waters of the Great Lakes. Their interest, I think, is in the question: Is there a relationship between that and the Great Plains.

Q Alright, turning your attention to page 3. Eastern Montana does not, as the Montana Power Company claims in its advertizing, average 12 inches of precipitation per year?

A Yes.

Q You make that statement, do you not?

A Yes, except I think I'm wrong; I think it's 15 that the Montana Power Company has had in its advertizing.

Q Well, you wouldn't fault it for decreasing it by three inches, do you?

A No.

Q What do you think the average precipitation per year is in eastern Montana?

A I would suspect it's between 12 and 15. May I add now that averages are essentially meaningless.

Q You've indicated that twice already, have you not?

A Yes.

Q And we're talking about the annual average?

A That's correct.

Q Now, you also make the statement there -- well, let's go back. You indicate eastern Montana does not, as the Montana Power Company claimed in its advertizing, average 12 inches of precipitation per year?

A Yes, maybe that's misleading, Mr. Bellingham. I would agree with you. I should have said that the average means nothing, rather than that it does not average that. I think that is sloppy writing.

Q Who did it?

A I did it.

Q I thought maybe one of your graduate students did.

A No way. They would be more critical than I of this.

Q Well, you don't mean to infer there, then, that the average is less than 12 inches, because I think you already testified it's between 12 inches and 15 inches?

A No, I do not mean to infer that at all; I mean to infer that the critical thing is when that moisture comes, not how much of it comes.

Q I think you indicated that between 12 inches and 15 inches?

A Yes.

Q When the Montana Power says that the average is 12 inches, that could be right in the neighborhood?

A It could be very well in the neighborhood, but it could also be and is extremely misleading.

Q Now, the Yellowstone River does not average a flow of 8.8 million acre feet per year at Sidney; this is another statement that you make categorically, do you not?

A Yes.

Q What is the average flow?

A I don't know. I don't know what it is. I will send you various calculations; I didn't bring them with me. As I've already pointed out, you find the year 1961 something in excess of 4.something million acre feet per year. I question the average on this case because I don't know what they are averaging and over how long a period of time. I have a very strong suspicion that this is a recent average and is applying to a rather prolonged and unusual wet period. I doubt very seriously that if you push the Yellowstone River back farther than that that you're going to come up with 8.8 million acre feet per year. Now, Mr. Bellingham, if you would like me to, I will send you the data that we have worked up thus far indicating that the 8.8 million acre feet per year is a very recent figure based on too small a time span to be accurate.

Q Well, I would be interested in that. Then you feel that the 8.8 million acre feet average at Sidney is too high?

A Yes, sir. I think it's too high if you're going to deal in terms of a reasonable span of time with respect to many things, reclamation, among others, or diversion of water.

Q Do you have any idea what that figure should be?

A No, I do not; but I can give you some data if you'll permit me to send it to you, which I think will come closer than this.

Q I would like to, at this time, hand you what has been marked as Applicants' Exhibit 165, which was admitted on August 19, 1975, during the course of the Board of Health hearing, through a witness, Phil Gibbs, who is a reasonal planning engineer of the Bureau of Reclamations at Billings, Montana. It is entitled, Northern Great Plains Resource Program Water Work Group Report.

A What page would you like me to go to?

Q Are you familiar with that report, sir?

A No.

Q You have never seen it before?

A No. I have heard of it; I have not seen it.

Q Would you take a look at page 12?

A What paragraph?

Q On the left-hand side, the first complete paragraph; what does that state?

A "Unconsumed water within the Yellowstone River Basin, which is essentially an approximation of water in excess of current use averages about 8.8 million acre feet annually, which corrected to the 1970 level of development and considered over a long period of time, 1898 to 1972."

Q Alright, I don't think we need to go any further than that.

A Alright. I would simply submit that lawyers work on one time scale, climatologists work on another, so do historians. That is not a very long time scale.

Q 1898 to 1972?

A No, I don't think it is.

Q Well, do you think there were any records prior to that time, sir?

A I think they can be approximated by calculating, again, pollen studies, sagebrush studies, and tree ring studies; dry years, that if you know now or in any given year or two or three years what the river flows, that by projecting backwards, you will come out with some kind of approximation.

Q Well, is it your opinion that this period of time referred to here, from 1898 to 1972, is too short a period of time?

A Well, it's pretty short. I have no cavil with the figure. It is pretty short; it does not point, of course, that is, again, the danger of dealing averages. It does not point out that during that period of time there has to have been periods, a la 1961, when it did not come near. Averages, Mr. Bellingham, scare the living wits out of me when you're talking about the

Great Plains.

Q It may scare the wits out of you, but they do have the figures here; average annual flow, do they not?

A Yes, they do have the figures, 1898 to 1978.

Q And that would be the average yearly flow?

A That's the average yearly flow, obviously, unless they made a mistake.

Q Now, at the bottom of page 12, the last paragraph.

A Which document are you referring to?

Q The same one, sir, and I am referring here to Applicants' Exhibit No. 165.

A Where did mine go? The page again?

Q Page 12.

A Yes.

Q And that reads, "The tabulation that follows is intended to illustrate the approximate quantities of unconsumed waters available." Does it not?

A Yes, that's what it says.

Q And it goes on to indicate that except for minor downward revisions to be expected with a precise updating of water right filings and applications, the quantities represent essentially the remaining water supplies after 1970, which can be considered for development in meeting the needs of all future uses. Did I read that correctly?

A You did.

Q You agree I can read correctly when I set my mind to it?

A Yes.

Q Thank you. At page 13, we have there a graph, do we not?

A Yes, Mr. Bellingham.

Q And we have a river and location.

MR. GRAYBILL: I'm going to object. It's not a graph; it's a chart.

MR. BELLINGHAM: I wouldn't want to be incorrect in my terminology.

MR. GRAYBILL: I like you to read correctly, Mr. Bellingham.

Q We have a first column, river and location, do we not?

A Yes.

Q Then we have the maximum annual flow in acre feet, the critical year flow acre feet, and the average annual flow acre feet?

A Yes.

Q And the Yellowstone Basin is the first mentioned there, and we have the Yellowstone River near Sidney; do we not?

A Yes.

Q And we have an average annual flow there of --

A 8.8.

Q -- 8.8 acre feet annually, and that's after --

HEARINGS EXAMINER: Is that 8.8 million?

MR. BELLINGHAM: Yes, sir.

WITNESS: 8.8 million, yes.

Q That refers to unconsumed water?

A Yes.

Q That's water that is available for further uses at this time?

A At this time.

Q Yes. So the actual average annual flow would be in excess of that figure, wouldn't it?

A One would think so, Mr. Bellingham.

Q I don't think there's any doubt about it; it would have to be
wouldn't there, if this was unconsumed?

A Mr. Bellingham, I would not cavil with you for one moment.

Q Not unless it served your purpose, perhaps, do you suppose.
Now, do you know what the annual growing season precipitation
is in the vicinity of Colstrip, Montana?

A No, sir, I do not.

Q You've addressed yourself to the eastern Montana area, have
you not?

A Yes.

Q And you have not --

A I have not addressed myself to Colstrip, Montana.

Q And you are aware, of course, of the coalbeds in the vicinity
of Colstrip?

A I am, sir.

Q And, here again, as far as the extent of these coalbeds are
concerned, you have not addressed yourself to the coalbeds
themselves?

A No, I have not.

Q Page 6, you're talking about the period 1917 to 1939?

A Yes.

Q I don't think I'm going to ask you questions about the history
of Montana.

A I wish you would.

Q Oh, no, sir. I'm not going to; I assume that you'd have a
ready answer for me, correct or not; and I would assume, also,
that it would probably be correct, in view of your experience.

A Thank you, Mr. Bellingham.

Q However, you state there that the intensity of the drought, and you're talking about the drought period from what to what?

A Give me the paragraph, please.

Q I'm sorry. It's 4.

A Now what is your question?

Q "In the face of the intensity of this drought," you're talking about 1917 to '39; I assume?

A Right.

Q "60,000 people of the 80,000 who had flooded in, now flood out."

A Yes.

Q And you go into the fact that they had to leave because they were hungry, ruined, destitute, and so forth?

A Yes.

Q But do you think that the drought was the sole cause of these people leaving?

A There is no such thing as a sole cause to a complex thing; it was the overwhelming cause, Mr. Bellingham, and there is no question about that; the overwhelming cause.

Q Well, there were other causes also, were there not, during this period of time?

A What, for instance? Quixoticness, perhaps, or discontent? Let me add this, that I base that contention on a massive series of interviews with the people who stayed and with the people who left. I have found no other reason except the drouth. We both know, Mr. Bellingham, that obviously some of those people left for other reasons. I assert that a vast majority did not; and that is an assertion based on a very substantial amount of research.

Q Well, what about the depression, commenced during that period, where we talk about --

A Mr. Bellingham, the depression really doesn't enter this calculation, because those 60,000 who left, plus or minus now, remember we are between censi, so that we do not have an accurate figure. The outflux took place by about -- the overwhelming majority of the 60,000 had left by 1925; the depression had nothing to do with their leaving. As a matter of fact, it had not, as you know, occurred.

Q You're talking about the main depression?

A Yes, and do you want me to talk about the agricultural depression, do you?

Q Well, I don't know if you need to go into that at this time. But, it's your statement that the majority left by 1925?

A That's correct.

Q Do you think that these people could have made it on their homesteads if -- let me finish here -- if the weather, in fact, had not been drought conditions, but had been wet conditions?

A Yes, sir.

Q Do you think 160 acres would have supported them?

A Oh, no, no. Most of these people didn't have 160 acres. They either bought railroad land -- after 1909 you're not talking about 160 acres, you're talking about 320. Almost all of them augmented that land after the first few good crops.

Q How many acres are we talking about?

A Well, I can't come up with that figure off the top of my head. I do have it, incidentally. We are talking somewhere in the neighborhood of 6-800 acres; but I swore to tell the truth, the whole truth and nothing but the truth; I'd have to look that up.

Q To the best of your recollection, though, that's --

A Yes, that's correct.

Q Turning to page 11 --

A Yes, sir.

Q First complete paragraph, sir.

A Yes.

Q You say that you've dealt with only two of the great booms and busts of Montana's history, and you want to go back to the great fur trade era; you mention that? You go back to the great fur trade era?

A Yes, it begins there.

Q What period of time are we talking about?

A 1820's, 1830's.

Q 1820's and 1830's.

A That was the height of it. It begins in 1807, to be specific.

Q And this is applicable, not only to the Pacific Northwest, but to the state of Montana, is it not?

A That's correct.

Q And you state there, "I could, it is true, go back to the great fur trade era -- and demonstrate that the American Fur Company -- in the name of jobs, prosperity, taxes and affluence, told us (Montanans) that there was in the trapping industry, 100 years of resources in the Montana area -- and that we would benefit tremendously from this enterprise." Now, I'm rather surprised that you say, "told us (Montanans)," because I didn't realize there were too many Montanans around in the 1820's or 1830's.

A Yes, there were. The average fur trader, and I think this can be so thoroughly documented that you and I need not pursue it because I can give you four volumes on it. The average fur trader intended to settle here, live here, and remain here; and there were a surprising number, putting all the American fur companies together, to say nothing of those who came from the Hudson Bay Company and the Northwest Company in Canada. So it is simply not true that there were no white people around 1820 to 1830.

Q I don't think anybody is inferring that there weren't; but would you put a figure upon the number of fur traders there?

A No, but I can get it for you, or an approximation of it. The American Fur Company had 300 people in the field in one year; that year was 1831. That's 300 people who are calculating and thinking, we're going to stay here. That's only one fur company; there are, at this time, 11 or 12 different fur companies involved. That is true that that is a sizable group and I wouldn't multiply by 12; but I'm giving you an approximation of the fact that there were a surprisingly large number of white people here.

Q And you infer that the American Fur Company, in the name of jobs, prosperity and taxes and affluence, told us there was in the trapping industry 100 years of resources. What about the taxes? What's the reference to there?

A I am equating taxes with furs. The region then known as Montana had no power of tax.

Q There were, in fact, no taxes levied at that time?

A No, no taxes. I wish there had been.

Q Well, they might have set us a worse example than we have already, I don't know; in your view, anyway. You talk on page 14 and on the previous page, I think, you're talking about a 30 percent tax?

A Yes.

Q I assume you agree with that tax, or the levy of that tax?

A Yes, I agree.

Q You think it's eminently fair?

A Yes, I think so. I know that you and I would disagree; I think that it's fair.

Q I don't think you and I need to disagree here on that tax; I don't think you've ever heard me make any statement one way or another?

A No, I was anticipating you, Mr. Bellingham, and I shouldn't have done that. Go ahead.

Q Really, you don't know what my opinion of it is, do you?

A No, I certainly don't.

Q And I'm sure you're not particularly concerned what my opinion is?

A Not at all.

Q Do you feel that 30 percent is too low?

A No.

Q Do you think it's too high?

A No.

Q Do you think it's just exactly right?

A No, I did not say that; I think it's fair and equitable and not confiscatory.

Q And you think that the 30 percent, at least as far as it matters now, are that it should stand as is?

A I would hope so.

Q Now, you're very much concerned, are you not, about the impact of taking water from the Yellowstone River?

A Yes, I'm concerned about it.

Q You're concerned about what may happen in the future to the Yellowstone River and the water?

A That is correct.

Q And you're concerned about the uses of water that the Colstrip units 3 and 4 will take from the Yellowstone River?

A That's part of the picture, certainly.

Q That fits in as a part of the over-all hypothesis, does it not?

A Yes, it does.

Q Do you know, for example, how much water units 3 and 4 are going to use?

A No, I have not. I know 830 some cubic feet per second at the present time were filed, and of course approved, in 1970; and perfectly valid. I don't know that that is allocated to 3 and 4 or if it's only designated for 1 and 2; I don't know. It's a lot of water.

Q Well, it certainly is; but do you know, and I guess you said you don't, what the maximum water consumption for units 1, 2, 3 and 4 is?

A No, Mr. Bellingham, I do not.

Q Have you read the findings of fact and the conclusions of law of the Board of Natural Resources and Conservation?

A No, I've read the summary.

Q I'm sorry, Board of Health and Environmental --

MR. GRAYBILL: Who are we referring to, Mr. Bellingham. You've got two Boards in there and two or three sets of --

MR. BELLINGHAM: I corrected myself, sir.

Q You understood me, did you not?

A Yes.

Q The Board of Health and Environmental Sciences.

A No, I have not, Mr. Bellingham.

MR. GRAYBILL: I'm not sure there is such a document, Mr. Bellingham; and I don't think you should ask him to read it. I haven't ever seen a signed copy of the order of the findings of fact and conclusions of law of the Board of Health; have you?

HEARINGS EXAMINER: Well, if you want to make an objection, please address here, and put some form of objection in and maybe we --

MR. GRAYBILL: I'll object to the question as calling for a conclusion that's not part of the record.

HEARINGS EXAMINER: Overruled.

Q Well, I think you'll find, sir, that findings of fact 32 state that the maximum water consumption for the units 1, 2, 3 and 4, running at full or 100 percent load, will be reached during the summer months of July and August of each year at the rate of approximately 56.12 cubic feet per second. That's

40,631 acre feet annually. Do you feel that that's too much water to remove?

A Mr. Bellingham, it's your job to cross-examine me, but I have got to make a statement, if you don't mind. I am not specifically concerned about 3 and 4; and I'm now going to make a statement with which you are going to violently disagree -- I hope not violently. Once the door is open on 3 and 4 -- go back to the Central Power Study. It is often said that the Central Power Study is inactive, inoperative and no longer with us; I happen to believe that it is. I am not concerned about 3 and 4 and the exact quantity of water it will take; I'm concerned about the future and proliferation of power plants in Montana, totaling, if the North Central Power Study were to come true, 200,000 megawatts. Now, you can say the North Central Power Study is dead; forgive me for still worrying that if 3 and 4 are approved, 5 and 6 are close behind, and you're now talking about 10,000 megawatt plants, two of them. You're talking about two 5,000 megawatt plants; you're talking about a number of 3,000 megawatt plants; and a dozen 1,000 megawatt plants. Now when you put that together with water in the Yellowstone Basin, I'm scared to death. So you're trying to pin me down to the specifics of 3 and 4; I don't want to be pinned down to the specifics of 3 and 4. They are not the root of my worry. If I thought that was all that was ever going to happen, I would not be concerned about those particular acre feet. I do not think that that is all that is going to happen, if 3 and 4 are permitted.

Q You anticipate my next question, then. If you're not concerned about that amount of acre feet that units 1, 2, 3 and 4 will withdraw from the Yellowstone River --

A I'm concerned about it, Mr. Bellingham, but I'm concerned about it in a much milder way than I would be were I not frightened and a lot of other people frightened that that is not the real issue.

Q Now I think you've indicated that the real issue is whether or not this opens the door to generation plants?

A Yes.

Q Now, I'm sure, Dr. Toole, that --

A You said you wouldn't do that.

Q -- that you're familiar with the Montana Utility Siting Act in a cursory sort of way?

A Cursory.

Q And that you're aware of the fact that each application for generating unit must be approved by the appropriate officials?

A Yes.

Q And you realize that, of course, 3 and 4, supposedly, will rise or fall on its own merits?

A The word "merit" troubles me. I'm not sure what 3 and 4 will rise or fall on. I would hope that it would rise or fall on the most thoughtful consideration of the Board of Natural Resources presented, meticulously going over the testimony of which you gentlemen have been so long involved, and in a most rational way, without preconception to prejudice or a priori conclusions. I recognize, Mr. Bellingham, that that is not often the case with human beings; but I would hope that that would be the case. When you say "merit," I don't know exactly what you mean. In my terms, I just defined what I would term "merit."

Q Do you have any reason to believe that the Board of Natural Resources --

A Of course not.

Q -- will not decide as they should?

A Of course not; I do not, sir.

Q And, assuming that 3 and 4 were granted, in some years hence another application were filed for further generating plants by perhaps another company or the applicants in this case, do you have any reason to believe that that application would not be decided solely upon the evidence and the facts that we're --

A Mr. Bellingham, we're almost getting back into the field of the philosophers, which I'd rather not do, because I don't understand philosophers. I think that it is simply human that once you have opened the door, it is extremely hard to prevent its further opening. I don't think that this is something that you and I need belabor over; it's just plain human and it is also a part of the way government operates, that if you grant 3 and 4, it is much easier to grant 5, 6, 7, 8, 9 and 10, even though you may be dealing with the same -- with a superb board. It is terribly difficult once you institute a tax ever to revise it again. It is equally difficult, I think, once you have opened a door of this kind of a thing, ever to close it again. Mr. Bellingham, I did not say impossible; I said extremely difficult.

Q That is your opinion?

A Of course.

Q And I'm sure that you recognize the fact that others may disagree with you?

A Of course.

Q Now, let us turn quickly to the field of reclamation.

MR. BELLINGHAM: Sir, could I have about 5 minutes?

HEARINGS EXAMINER: Maybe the Doctor would like a break too? I don't know how your cardiac is; you mentioned that earlier.

WITNESS: My pulse is racing at a very healthy rate, sir. You can do anything you wish.

HEARINGS EXAMINER: Alright, if you wish to take a 10-minute break; and while we're taking a break, then, as far as you're concerned, go ahead and do what you need to do, Mr. Bellingham; we have about 3 public witnesses that have some time schedules too, and I could put one of them on while you're doing whatever you want to do during the break.

MR. BELLINGHAM: The only problem is that I was going to interrogate them.

HEARINGS EXAMINER: I gave Mr. Peterson one of the statements, number 1; so why don't you and Doctor Toole get a cup of coffee or something. And also, at this time, then, I'd like to clarify -- Mr. Shenker wants to speak on the record about rebuttal witnesses; right.

(WITNESS EXCUSED TEMPORARILY.)

MR. SHENKER: I'm just kind of interested to hear who the rebuttal witnesses are going to be and Jack and

Bill said they were going to tell us today.

MR. BELLINGHAM: Are you leaving today?

MR. SHENKER: Yes.

MR. BELLINGHAM: That's the best news I've heard in a long time. No, I think there's no problem.

HEARINGS EXAMINER: Jack will get a list of them. You are going to interrogate two of the public witnesses, right? Well, there's a couple others here who are public witnesses that possibly Jack could cross-examine. Yes, Mr. Graybill?

MR. GRAYBILL: I don't like to butt in here but I was in the middle of an examination. Are we taking my witness off and putting a public witness on?

HEARINGS EXAMINER: Just during the recess, where we wouldn't be doing anything otherwise, as I understand it.

MR. GRAYBILL: And Mr. Bellingham isn't examining them.

HEARINGS EXAMINER: Well, he's not going to. There's another very short one; Mr. McRae has a short written statement and he flew up from Ashland.

MR. GRAYBILL: May I, before we get started on that, let me ask a point. I don't intend to be here tomorrow and because of our schedule, I have a witness that's coming from Billings tomorrow, would like to; I wonder if Mr. Peterson and Mr. Bellingham would object if I let the DNR present the witness, and if necessary, redirect; the DNR instead of me?

HEARINGS EXAMINER: Which witness is that?

MR. GRAYBILL: Mr. Robert Morris.

HEARINGS EXAMINER: Do you know what time he'll be here so I'll know for scheduling too?

MR. GRAYBILL: I think it's after noon.

HEARINGS EXAMINER: We'll find out, then, but it seems like we're not going to have much in the morning. I might start a little later.

MR. GRAYBILL: Well, whenever he comes, we'd be glad to put him on; but Don has agreed to take him for me. Alright, thank you.

HEARINGS EXAMINER: You go ahead and look over your notes, Mr. Bellingham, and we'll take these. Yes, sir, Mr. Meloy?

MR. MELOY: Is it your intent to permit public witnesses to continue to come through as long as we are here?

HEARINGS EXAMINER: I think, and perhaps the good gentlemen of the press might give us some help on this, our schedule appears to be that tomorrow we have one Northern Plains witness and we have several public witnesses. We'd be happy to take all the public witnesses who are able to come tomorrow. Of course, that's short notice; but, in fact, we have contacted either by letter or telephone anyone who has indicated to us that they would like to attend. Then we're going to recess when we get through tomorrow, and we'll recess until Tuesday, the 16th at 9:00; and then we'll take the last Northern

Plains' witness, if that is the last one, Mr. Johnson. And then the Environmental Defense Fund has one witness we'll take; then we'll take your three members of the Northern Cheyenne Tribe; and then we'd like to take all the rest of the people who want to appear as public witnesses. And that would probably commence in the afternoon of the 16th; that's on a Tuesday. And at the conclusion of taking the public witnesses, either on Tuesday, then that would conclude the case-in-chief, unless we have some left over Tuesday night that we have to run -- well, we could probably take them all Tuesday, unless we have a great deal. We've had 80 some so far. Together I think we've had 158 witnesses testify to date in this hearing.

MR. SHENKER: You forgot to mention Mr. Tourangiean.

HEARINGS EXAMINER: Mr. Tourangiean, yes, is going to testify. When are you going to have him come?

MR. SHENKER: The 22nd at 1:30.

HEARINGS EXAMINER: Alright, that's Monday -- on the 22nd. We're going to complete the case, but then I would contemplate we should complete with public witnesses. We're going to have one other witness, who is Mr. Tourangiean, we'll schedule along with the rebuttal, which will follow on the 22nd. We've got Tourangiean on the 22nd. That's subject to your scheduling problems. Is that still alright with you?

MR. PETERSON: That's all right.

HEARINGS EXAMINER: And then you'll follow with rebuttal, then, after Mr. Tourangiean.

MR. PETERSON: Yes.

MR. MELOY: As long as we are here in hearing, whether with rebuttal or surrebuttal, is it your intent that public witnesses who can't make it until then would not be able to testify?

HEARINGS EXAMINER: It would be our intent that after we get our case-in-chief in, that we're just on rebuttal. So if anyone wants to testify, they should come tomorrow, or they should come on Tuesday, the 16th.

MR. MELOY: Yes, I think it would be very important, Mr. Davis, to try to publicize that as much as possible, if you're saying that the last date for witnesses from the public to testify is Tuesday, they should know about that.

HEARINGS EXAMINER: I think so; and that's why I asked if we could get some help from Chuck, perhaps; we'd sure appreciate it.

MR. PETERSON: How wide do you think that broadcast should be made?

MR. MELOY: At least we should send the public crier around Butte.

HEARINGS EXAMINER: Alright. Mr. Peterson, do you want to give a list of who you anticipate, as near as you know at this time, to call in rebuttal?

MR. PETERSON: We tentatively plan to call the following individuals on rebuttal: Mr. Coldiron, Mr. Labrie, Mr. Gregg, Mr. Gilder, Mr. Olsen, Doctor Grimm, and all of these people are with the Montana Power Company. And then Kent Anderson, Glenn Nogle, Cal Cumin, Robert Logan, Mr. Woodley, Robert Carol, Doctor Edmonds, Doctor Brandt, Doctor Colucci, Doctor Pack. How many did I give you, 17?

HEARINGS EXAMINER: I have 15 now.

MR. SHENKER: 16.

MR. PETERSON: Mr. Schwinden.

HEARINGS EXAMINER: Commissioner of State Lands?

MR. PETERSON: Yes.

MR. SHENKER: As I understand it, written statements are going to be prepared on behalf of all the rebuttal witnesses?

MR. PETERSON: Yes.

MR. SHENKER: We will have those on Tuesday of next week for cross-examination on Monday of the following week?

MR. PETERSON: We'll have most of them in the required time.

MR. SHENKER: And some of them you won't have in the required time?

MR. PETERSON: Well, you're not going to start until Tuesday.

MR. SHENKER: We're not going to start on Monday?

MR. PETERSON: I thought we were going to start on Tuesday on rebuttal.

HEARINGS EXAMINER: That's something we're going to have to settle now. Mr. Tourangiean is coming on Tuesday at 1:30.

MR. SHENKER: Monday.

HEARINGS EXAMINER: Monday at 1:30 and then we could go ahead Monday afternoon, if you have any witnesses that would be available then, and utilize that time.

MR. GRAYBILL: Monday, what date?

HEARINGS EXAMINER: The 22nd. Are you ready to proceed, Mr. Bellingham, with Doctor Toole?

MR. BELLINGHAM: No, I am not.

HEARINGS EXAMINER: Mr. McRae, will you come up and we'll put --

MALCOLM McRAE, appearing as a public witness, having been first duly sworn upon his oath, both as to his written direct testimony and as to the oral testimony to follow, was examined and testified as follows:

HEARINGS EXAMINER: And the record will show, I guess you're familiar from being here so long this afternoon, Mr. McRae, that where you have a written statement, it just goes into the record, right directly to the Board. You don't have to reread it, and, of course, that saves us having to retype it, and so forth. However, if there's anything you want to add to it, you may do so. If not, they can ask you some questions on it. Is there anything further you wanted to add to it?

WITNESS: No.

(THE WRITTEN DIRECT TESTIMONY OF MR. MALCOLM McRAE WAS DIRECTED TO BE INSERTED AT THIS POINT.)

PHONE
784-2440

McRAE'S SERVICE

RANCH HARDWARE
FARMHAND
ASHLAND, MONTANA 59003

PHONE
784-2440

NEW HOLLAND

ALLIS-CHALMERS

TO: The Board of Natural Resources

I own and operate a hardware, garage, and implement business in Ashland, Montana. I am concerned with the human factors and social changes that are surely to come if Plants 3 & 4 are built.

I believe that no one has the right to change a way of life long established. I believe no one has the right to change a beautiful country that contributes much to the Nations food supply. I believe no one has the right to deprive a nation of an area that adds to outdoor recreation.

We must remember that people pollute the same as Plants. We are at the crossroads. Plants 1 & 2 located at Colstrip were a mistake. I believe if Plants 3 & 4 are allowed to be built in the same area it will open the flood gates. Applications will come from everywhere and the precedent will have been established. Lets let these Plants go where they belonged in the first place -- somewhere far from Montana.

Malcolm McRae

EXAMINATION OF MR. McRAE

Cross, by Applicants

By Mr. Peterson:

Q Mr. McRae, I have just a few questions, sir. How long have you resided in Ashland?

A All my life; well, right in that area, not right in Ashland, in that area.

Q Are you related to Wally McRae?

A Yes.

Q What's the relationship?

A First cousin.

Q Are you a member of the Northern Plains Resource Council, sir?

A Yes. I'm a member in the sense -- I'll qualify that a little -- I'm a member in the sense that I do pay my dues; I've never been to a meeting.

Q How long have you owned the Ranch Hardware and McRae's Service at Ashland?

A Nearly seven years.

Q Are you the sole proprietor?

A Yes. Well, me and the bank.

Q You're like everyone else. As I understand your position, you believe that if 3 and 4 go on the line with 1 and 2, there will be a tremendous influx of people in the area who will pollute the area, and that is your basic objection?

A I surely do, yes.

Q Is that after the construction of the plants, Mr. McRae, or is that during the entire period that they would in on line?

A Well, of course, we can see now a general -- not as big a

A labor force, I don't suppose, working now, since 1 and 2 are done. I've been on the school board at Colstrip and seen this influx go through. You know, it's still there; but it's not working as much. But I think during the construction phase would be the worst.

Q Once the construction phase is completed, do you anticipate there will still be the same people problem with the employees who are hired solely to run the plant?

A Well, what I've been able to read, there would be a lesser amount, if nothing else was done.

Q About 110 to 125 people to run the units 3 and 4?

A I think pretty much that projection is what --

Q Is that excessive in your amount?

A No, only I'm concerned, I guess, in the relationship to 3 and 4. I can't tell you exactly why I feel like we're going to get into an area where the gates may open and then there may be more applications.

Q So your basic concern is that after 3 and 4 are approved, there may be applications after that which would lead to the addition of other plants?

A Yes, and, of course, you have to understand we're getting some influx now from the Decker Mine down. We understand we are going to get a new oiled highway, in fact, this year, which is bound to increase the traffic.

Q Is that objectionable to you as a dealer in farm equipment?

A Yes.

Q Is the Decker Mine located -- how far from your place?

A It is approximately 60 to 70 miles.

Q Is that the land that was sold -- Is Evan McRae, Jr. a relation to you too?

A Yes.

Q Is this mine located on the land that he sold to Decker about 1958 or '59?

A No, that's the Peabody.

Q Excuse me, okay. Are they doing any activity in the area?

A They're mining some.

Q They are?

A Sending coal out on coal trains.

MR. PETERSON: I have no further questions. Thank you, Mr. McRae.

(WITNESS EXCUSED.)

BROTHER TED KRAMER, appearing as a public witness, having been first duly sworn upon his oath, both as to his written direct testimony and as to the oral testimony to follow, was examined and testified as follows:

HEARINGS EXAMINER: Please be seated, sir. And you appear as an opponent, do you not, of the facility?

WITNESS: Yes.

HEARINGS EXAMINER: Very well, Mr. Peterson can ask you questions. Do you have anything you wish to add to the record?

WITNESS: No, I do not.

HEARINGS EXAMINER: The record should show that you previously sent in a statement and a petition signed by some of the other folks in your area, which is attached to your statement, and which will go to the Board as part of your statement.

WITNESS: That's correct.

MR. PETERSON: Maybe we should have the witness identify himself for the record.

HEARINGS EXAMINER: Will you identify yourself and where you're from and anything along that line you want to say?

WITNESS: My name is Ted Kramer. I am a Capuchin Franciscan brother, and I work in Ashland. I am involved in religious education.

(THE WRITTEN DIRECT TESTIMONY OF TED KRAMER WAS DIRECTED TO BE INSERTED AT THIS POINT.)

Brother Ted Kramer

If development is to be effective and total, it should bring people together. Since development and pending development of coal has become an issue in Southeastern Montana, it has tended to polarize people and cause breakdowns in families and social structures rather than bring people together.

Development should call forth the best in the human community. Many studies have been made on the economic situation and the environmental impact of coal development, but they seldom relate to the total growth of individual human beings or to the total good of the human family. Without minimizing the importance of economic and environmental studies and research, most of which only minimally consider man's physical needs, no consideration is given to his psychological needs, his spiritual and moral needs and the social impact on the individual and the larger community.

As spiritual leaders in Southeastern Montana, we would be remiss of our responsibility to the people, if we would fail to share some of the spiritual-moral principles which foster the total growth and development of people.

Some of the principles we urgently call to your attention at this time are:

1. ECONOMIC DEVELOPMENT CANNOT BE SEPARATED FROM HUMAN DEVELOPMENT. Every social question extends to all human relations. We must work by united planning for the full development of each individual and for the common progress of all people. Every facet of economic, social, spiritual and cultural understanding must come

together in concerted action, viewing man in his totality and inter-relatedness.

2. DEVELOPMENT IS MORE THAN ECONOMIC GROWTH. Each culture, rich or poor, possesses values handed down by its ancestors. When these contain genuine human values, it is wrong to reject these in favor of mere economic development. Any culture allowing this to happen is throwing away the best part of itself. In order to live, it would disregard the reason for living.
3. WITH DEVELOPMENT WE HAVE AN OBLIGATION TO THE COMMUNITY OF MAN. Each person is a member of society and therefore belongs to the entire community of man. All must promote the full development of the entire human society, but not to the detriment of individuals and their lifestyle. The mutual bond of all mankind not only gives benefits, but also imposes obligations upon us. Just to provide jobs for some is not necessarily good if it displaces other persons from their employment and way of life. We are the heirs of the works of past generations and are obliged to be concerned for the welfare of future generations.
4. POSSESSIONS MUST NOT TAKE PRIORITY OVER PERSONS. An ever increasing supply of possessions, which require increasing amounts of energy to build and to operate, must not be considered the ultimate goal by governments, corporations or individuals. The exclusive quest for economic possessions impedes man's human development and opposes his true greatness. Very often, men who make material possessions their goal have given clearest evidence of moral underdevelopment.

The earth belongs to all, not only to the rich. Private ownership does not confer on any one a supreme and unconditional right. No one can set aside possessions solely for his own use and advantage while others lack the necessities of life.

Those living in less than human conditions are those lacking the minimum sustenance for life. Social structures must always serve the people. People are never to be enslaved, exploited or overpowered by others.

Business has a right to a just profit to enable it to continue to exist and contribute to the developmental progress of the human person. However, excess profit taking which concentrates the wealth, power and decision making in the hands of a small public or private group under the guise of providing economic opportunities for developing peoples is morally wrong. It further oppresses human life and continually widens the gap, economically and powerwise between the rich and the poor.

In conclusion, we oppose Power Units 3 and 4 at Colstrip and any further coal development until the four principles stated above are woven into the current and planned future development of coal in this area.

The undersigned support and concur with the principles set forth in this presentation.

Eucharistic Franciscans Community from Ashland, Montana

Sister Anne Waick

Sister [illegible]

Sister Mary Kay Mahowald

Sister Rosalia [illegible] S.S.F.

Sister [illegible]

Sister Jo Anne Heck, S.S.F.

Sister [illegible] F.

The Capuchin Community from Ashland, Montana

Rev. Emmett J. Hoffman O.F.M. Cap.

Bro. Elliot F. [illegible] ofm Cap.

Fr. Paul [illegible]

Bro. Ted Kramer, Capuchin

Bro. Philip Schwartz, ofm Cap

June Beck

[illegible] Rosa

Marjorie [illegible]

[illegible]

EXAMINATION OF TED KRAMER

Cross, by Applicants

By Mr. Peterson:

Q How long have you resided in Ashland?

A Since 1965; 11 years.

Q And where were you prior to that time?

A I was in Indiana.

MR. PETERSON: I don't think I have any questions, Mr. Davis.

HEARINGS EXAMINER: Very well, sir. You're excused, and if you don't have anything else to add, then the other priest that's with you -- do you wish to come up and testify orally, or are you just joining in this statement? Why don't you say who your partner is that's with you, Father.

WITNESS: This is Father Paul Reichling, and he works with me in Ashland. He is involved in our foster home -- Cheyenne Home, which is a foster home there at Ashland. And he was originally supposed to be sitting here, but somehow we got switched. So I'm sweating.

HEARINGS EXAMINER: You did a very good job, and if you don't have anything else, thank you, sir, and your statement will go to the Board along with the other evidence in this hearing.

WITNESS: Thank you very much.

(WITNESS EXCUSED.)

DR. K. ROSS TOOLE, having been previously called as a witness by the Northern Plains Resource Council, and having been previously sworn upon his oath, resumed the witness chair for the continuation of his examination and testimony:

CONTINUATION OF EXAMINATION OF DOCTOR TOOLE

Cross, by Applicants

By Mr. Bellingham (continuing):

Q You are familiar, sir, with the fact that the United States, through its Department of Commerce in recent years, and apparently the Department of Agriculture in prior years, the Weather Bureau has prepared and has distributed climatological summaries of precipitation of various areas in the United States?

A Yes, I'm aware of that.

Q And that would also include eastern Montana and various weather stations?

A Yes, it would.

Q In order to shorten this, I'm going to hand you what has been marked as Applicants' Exhibit 241, and ask you what that purports to be?

A You want me to read it?

Q No, no, sir, I just want to know the title.

A Climate Summary of the United States, United States Department of Agriculture Weather Bureau, Willis B. Gregg, Chief.

Q And immediately under that it states, "Climatic data herein from the establishment of stations since 1930." Does it not?

A Yes.

Q And I think you'll find there a page 11-3, do you not, temperature and precipitation as far as the Miles City station is concerned.

A You've lost me. Yes, all right.

MR. GRAYBILL: Where are you, Mr. Bellingham. Which one?

MR. BELLINGHAM: 241.

Q At page 11-8, it gives the precipitation for Colstrip, Rosebud County, Montana, does it not, of course, through the years?

A This is very small type. I see Billings; I see Busby; I see Bridger; I see Colstrip, yes, Mr. Bellingham, it does.

Q And below that Crow Agency?

A Yes, Mr. Bellingham.

Q And I could go on.

MR. BELLINGHAM: At this time I will offer into evidence Applicants' Exhibit 241.

MR. GRAYBILL: Are you just offering the one, or are you going to offer all of this, Mr. Bellingham? Are you going to offer the rest of these?

MR. BELLINGHAM: Yes, I am.

MR. GRAYBILL: Well, Mr. Hearings Examiner, I'm not inclined to try to keep the power company from trying to put any records that they want in the transcript, so I would be inclined to let them put all of this in. I don't know if it's thorough or if they culled it, but I'd be inclined to let them put it all in. And, of course, I can examine it at length and if I want to argue with it, I can. Why don't we just go ahead and put all of them in, instead of take a lot of time on each of them?

MR. BELLINGHAM: Fine. I appreciate that. Incidentally, Mr. Graybill, I have the complete documents here; but because we obtained them rather late, I did not copy the entire document in some cases, just certain portions of it. So I do not have complete copies of it, but I will be glad to have them photostated.

MR. GRAYBILL: Would you photostat and give us the complete document?

MR. BELLINGHAM: No problem. Applicants' Exhibit 242 is also a precipitation report from 1931 to 1960 for the state of Montana; and 243, Applicants' Exhibit, is another report from 1931 through 1952 for Montana precipitation; 244 is another report for the period -- We're looking at 244 now and I'm attempting to find the period that it applies to. I do not find it; however, it's another report. 245 is a summary of Colstrip, the station at Colstrip for the years of 1941 to 1970; 246 is a summary of various weather stations, and, again, a Department of Commerce publication, as all of these are, for the period of 1941 through 1970; and Applicants' Exhibit 247 is another summary. This one is applied to Miles City only for the years 1935 to 1974. I wanted to identify them in that fashion.

HEARINGS EXAMINER: You've got Exhibits 241 through 246 as the ones we've been discussing; is that correct?

MR. BELLINGHAM: I think it's 247, sir.

HEARINGS EXAMINER: You've got 247 too?

MR. BELLINGHAM: Yes, sir. 241 through 247.

HEARINGS EXAMINER: Mr. Graybill, as I understand it, you have no objection, but you want to get copies of these so you can --

MR. GRAYBILL: I'd like to get copies of the original total document so I know what he took it out of, you know.

HEARINGS EXAMINER: And I understand Mr. Bellingham will furnish you those?

MR. GRAYBILL: Yes.

HEARINGS EXAMINER: Very well. They will be admitted.

Q Now, let's turn to reclamation, sir, because you do concern yourself with that; do you not?

A Yes.

Q Here again, you're not a reclamation expert, are you?

A Mr. Bellingham, there are two meanings to the word, as you well know. Reclamation is a very old word and it's a very old issue in the west. As a matter of fact, if you begin in the year 1860 and go all the way through. Montanans and the federal government were constantly concerned with reclamation in the broad sense of the term. That is to say, there was, of course, a wide spread belief over a very long period of time that you could divert the great rivers of the brown midriff of America, the Great Plains, and create thereon a garden of Eden. This was a controversy which lasted for years and years and years. No western historian could do other than concern himself with the particulars of that controversy over those years. In that sense, I consider myself an expert on reclamation. The narrow sense of the word, reclamation, is, of course, falls, of course, in the field of agronomy, soil science. I do not claim expertize in that narrow field.

Q Have you viewed the reclamation project down in the Colstrip area?

A Yes.

Q Are you familiar with the Hannah demonstration site of reclamation in Wyoming?

A No.

Q That has an annual rainfall there from 6 to 8 inches?

A No, I am not.

Q You're not aware of the progress that has been made there?

A No, I am not.

Q Wouldn't you say that the key to reclamation is management?

A No, sir.

Q You don't?

A No, sir.

Q What is the key?

A The key is weather; the key is precipitation; the key is not average annual precipitation; the key is precipitation for a sufficiently long period of time to prove that it can be done. And any short range, plot, demonstration or what you, does not demonstrate either that it can or cannot be done; but on the behalf of people who are concerned with this matter, the burden of proof lies with those who presume to reclaim, not on those who say it is possible, and you simply have to accept that.

Q Well, given a certain amount of rainfall and assume that it's adequate along with fertilization, don't you agree that management is going to be one of the keys?

A Well, may I ask you, Mr. Bellingham, what you mean by fertilization and what you mean by management, because I'm not quite clear in my mind as to what you're driving at?

Q Page 15 you indicate that demonstration plots benefit absolutely nothing except for PR purposes?

A Yes.

Q "Unless, of course, reclamation proves feasible and economical without imported topsoil, fertilization, and irrigation!" Well, now, as far as those plots down there that they're working on down in the area of Colstrip, and you're familiar with them, they're not importing topsoil there, are they?

A No, and I'm sorry if I implied that. My reference to topsoil is that conservationists are constantly considering the possibility of bring in topsoil because they feel that without it, reclamation won't work. I did not mean to imply that topsoil has been ever brought into Colstrip. My understanding is that it has not.

Q Do you feel that topsoil is a necessity?

A I don't think that -- well, if you will put in Illinois topsoil or loam to the extent of 6 feet, yes; and if you have 60 inches of precipitation per year, you can reclaim the Illinois absolutely without problem. I would think it would be very dubious, even with topsoil, let's say 6 inches; even with topsoil, I think reclamation dubious until it is proved that it can survive in the cyclical periods to which I have referred.

Q Well, that would take a long time.

A Yes, sir, you bet it would.

Q And how long a period of time are you talking about, then, before --

A I think that if you can -- if the demonstration plot at Colstrip or anyplace else, with induced seeds, started with fertilizer, irrigated, can last through a good solid drouth, you, sir, will have convinced me. The evidence so far, which is all I have to go on, is that it will not survive.

Q What do you base it on?

A Well, I base it on the fact that nothing grows -- nothing grows; you have just plain dust bowl conditions in which tumbleweeds don't even grow. When you are talking about precipitation in the growing period of 3 inches, 2 inches; and you're talking about wind velocities of 30 miles an hour, which almost invariably accompany drouths; and you're talking about locusts, which almost invariably accompany drouths; and you're talking about wild worms and cutworms, which almost -- and you're talking about humidity, Mr. Bellingham, in the range of 4 percent, which means that your skin cracks. So that however way you manage, whatever you do, you have to contend with that basic root fact, the weather pattern in eastern Montana. So when you ask me about management, I say, management certainly plays a role; the question remains, can it or can technology, or can anything else, beat the violence of nature?

Q Well, you're giving us the worst adverse conditions. Assume we have a normal climatic condition --

A Mr. Bellingham, normal is violent swings. Normal is not an average; I keep coming back to this. Normal, to the Great Plains, not just to Montana, is the violence of the Plains: from wet to dry, from wet to dry, from wet to dry, beginning, Mr. Bellingham, with a condition which is semi-arid to begin with. We're not talking about 60 inches of precipitation annually. So that when you use the word normal, that is terribly misleading.

Q Let's go back to the last 10-year period; do you think that reclamation could have been successful at Colstrip during this period of time?

A I think it's problematical; it might. I would say that if you're talking, for instance, about 770,000 acres, you're not going to be able to irrigate that; you're not going to be able to fertilize that. Colstrip was irrigated and fertilized. If you're talking about a 10-acre plot, that is perfectly feasible; and I think during the wet period, yes. But are you going to irrigate and fertilize, let us say, 700,000 acres? That is beyond the pale; it's impossible in terms of irrigation, in terms of fertilization. At the price of fertilizer today, that's out of the question.

Q Well, when you say 700,000 acres, where do you get that figure?

A Arbitrarily. I'm talking about if you go into massive, massive stripping. Don't talk about irrigating or managing or fertilizing, because it won't -- can't be done.

Q You're aware of the fact that they are fertilizing in the beginning, but they intend to cut that out?

A I'm aware of that; I'm aware of that.

Q And you are aware of the fact that they are also irrigating in the beginning, but they intend to cut that out as well?

A I do; I'm aware of that.

Q And that they have not imported topsoil?

A Right, I'm aware of that.

Q And when I say, we're talking about the reclamation today down at the Colstrip area?

A Yes.

Q We understand that, don't we?

A Yes, we understand that. I might add something, if I may?

Q Yes.

A Perhaps you can answer this question, because I ask it out of inquisitiveness. Of course, bond was put up -- bond is put up on reclamation by the Department of State Lands; why has the bond now not been released at Colstrip on their demonstration plot or been released?

Q I can't answer that; I have no idea.

A You understand what that does to a layman like myself; it leaves me to believe that the bond has not been released because reclamation has not been successful.

Q I think you're wrong in that conjection; and I suspect we'll have evidence regarding that later on, hopefully.

MR. GRAYBILL: Are you sworn, Mr. Bellingham?

MR. BELLINGHAM: No, but I'm following your precedent, Mr. Graybill.

MR. GRAYBILL: Okay, then I'll follow yours and ask you to stop.

MR. BELLINGHAM: I was asked a question, and I answered it, as I recall.

Q Do you know how much coal is going to be utilized for 3 and 4?

A No, sir.

Q Do you have any idea?

A No, sir. I would be delighted to be illuminated on the subject, but I do not know.

Q Do you have any idea how many acres per year will be utilized for coal development by 3 and 4?

A No, I do not.

Q Does the figure of 120 acres strike you as a reasonable figure

A Nothing would strike me as anything; I simply am not capable of answering that question.

Q Now, you indicate on page 16 that the companies themselves have asserted that they can and intend to mine us out in 20 to 30 years?

A Yes, sir.

Q What companies intend to do that?

A I wish you hadn't asked that. I will, again, say Peabody; but if I may, I'll have to send you that assertion, because I'm not quite sure. The figure also has been, as I'm sure you well know, released by the Department of Interior. It is their estimation in their coal task force report, which I believe was dated 1974. After their own study, they concluded that at a rapid pace -- we're talking about 20 to 30 years of mining. On the first issue, I'm sorry, I will have to assert that I believe it was Peabody, but I'll have to check.

Q Nobody else other than them, as far as you know?

A No, no.

Q Are you aware of the fact that a previous witness in this case for the DNR, a Mr. Brewer, indicated that as far as the depreciation of coal in the United States in concerned, he believed that it would be on the order of several hundred years and could be as short as 300 years or as long as 500; and he indicated that 500 years has been a figure widely used?

A Mr. Bellingham, of course I'm not familiar with that particular gentleman or assertion; but let me say this. We're dealing again with what rate and what pace are you speaking about? If you wish to stretch out our coal reserves to 500 years, clearly, and set that -- since we know the tonnage -- clearly you can stretch it out to 500 years, or odd infinitum for that matter. I don't know what basis he's talking.

Q On the basis of energy projections for the future.

A Well, again, I haven't read the report, and so forth and so on. If somebody has asserted and guaranteed that we have sufficient coal in this country to last 500 years, I would have to go back and say, I think that's very very dubious, depending upon the rate. And the projections are, historians are not supposed to deal in them; you know I do, but I'd be very suspect of the figures, that's all.

Q Would you rather believe the 20 to 30 year rate here?

A No, I wouldn't necessarily say that. I would say that if the North Central Power Study, if other studies by the Department of the Interior carry out, yes. If we are talking about 200,000 megawatt plants in Montana, I'd be surprised if it lasts 20 years, because that megawattage is almost brosticnagion in proportions and I would be surprised if they could be fed in 20 years.

Q Well, that's pure speculation again, is it not?

A Well, I don't think the North Central Power Study, sir, is speculation. There it is; it was done, as you well know. It's a very basic document; it's endorsed by the Department of Interior and 19 investor-owned utilities. It took 2 years to make; it is very very specific in the plants, there size, where they are to be located. You also get a very definite map of how the water is to be brought to each of these plants, what reservoirs are to be built, what storage facilities are to be built. I don't think the North Central Power Study, sir, can be called speculative. There it is, and until someone demonstrates or says and someone in interior says "no, we now cancel the North Central Power Study," what choice do I have, Mr. Bellingham, but to believe that it is not speculation; it is the plan.

Q Well, insofar as these generation plants are concerned in the state of Montana, we have a Utility Siting Act, do we not?

A Yes, we do.

Q And each plant that's applied for under the Montana Utility Siting Act is going to have to meet those requirements?

A Yes, Mr. Bellingham, they are going to have to meet those requirements. I might add that our Utility Siting Act, and you know this better than I do, can be overridden at any juncture at any time by the Congress of the United States, which might be very much inclined to do so if people start to get cold in Pluckemin, New Jersey. So that the Utility Siting Act is not an overall protective covering for us; we may not rest comfortably with it. It is a state law; it is not the supreme law of the land.

Q Well, once again, you're speculating, now, as to the future.

A I'm not speculating about the power of Congress to undo Montana's Utility Siting Act; there's no question about that.

Q Well, as far as they're going to do it, you're speculating on that?

A I'm not speculating on the fact that Project Independence is very very specific and that it is the present policy of the Interior and though that's not the Congress, tremendous pressure is being put on the Congress right now, under Project Independence. I am not speculating about the fact that three strip-mining bills have been vetoed by the President. I'm not speculating, above all, about the fact that the Utility Siting Act of 1973 is not sacred in the eyes of Congress; and it's certainly not sacred in the eyes of the Department of the Interior.

Q Well, it's still the law in the state of Montana, is it not?

A It's the law in the state of Montana, very limited.

Q And that's what we're concerned with in this hearing?

A No, sir, not if the law of the state of Montana can be overridden at a moment's notice by the Congress of the United States.

Q As far as this hearing is concerned, we're talking about the Montana Utility Siting Act?

A I don't think you can narrow it like that; I don't think that you can make -- the question you asked me leads me to the necessity of saying the Utility Siting Act has grave limitations in Montana.

Q Are you fearful that it's going to be repealed?

A Yes, sir.

Q As far as your drought cycle is concerned, what do you feel should be done? Let's carry it one step further.

A Alright, I'll answer that. I think we should recognize what we have failed to recognize since man first saw the Great Plains; that what is normal for the Great Plains is drouth, that drouth is not an aberration, that drouth is not an irregular thing, that drouth is a regular thing; and that man, if he is going to live and do business on the Great Plains, must come to terms with the nature of the Plains, and inherrent in that nature is drouth. There is nothing we can do, so far, Mr. Bellingham, about the weather. But there is something we can do, and that is recognize the nature of the Plains and abide by the rules of nature, which are extreme.

Q You don't think we've done that?

A No, sir. We have not done it; we certainly have not done it.

Q Is strip-mining a step in that direction?

A Yes, sir -- a step in what direction?

Q As far as meeting the problems that you referred to. Oh, excuse me, strip farming?

A Not only is it not, but strip farming or summer fallowing, and they are in essence the same thing, have now led, as you well know -- strip farming and summer fallowing, going back to the 1920's, when the United States government and the Montana soil scientist people were saying summer fallow, summer fallow, strip farm, strip farm, has now led in many areas, as you know, to a critical problem called saline seep. We have 250,000 acres destroyed now by saline seep; we have a potential of 16 million acres in Montana potential saline seep areas. If you are implying or asking, do I not think that strip farming, rust resistance wheat, summer fallowing, are solutions to the drouth problem; my answer is not only are they not solutions, they, of themselves, have been terribly destructive. It took us from 1920 to 1969 to find that out. May I add one more thing, Mr. Bellingham? Saline seep is a very very old problem. In the year 1800, by edict, because they could operate that way, France banished all summer fallowing and strip farming because they had saline seep; and went and are to this day, it is forbidden in France and you have to rotate crops whether you want to or not. Now that was done under a dictatorship; we cannot do that in this country. No, sir. Summer fallowing and strip farming are not an answer to drouth; on the contrary. They are a further invitation because, again, of a misunderstanding of this land to further disaster.

Q Sprinkler irrigation?

A What about it?

Q Is that an answer?

A It's certainly not an answer, because there is no way -- and good God, if we don't have the experience after --

The studies of irrigation on the Great Plains go back to the year 1862 under John Wesley Powell. You cannot sprinkler irrigate under any reclamation policy devised by anybody, any substantial portion of the Great Plains, including eastern

Montana. Now, it's perfectly true that in projects like Huntley, you can do small small areas. We're talking about the Great Plains, per se, sprinkler irrigation is not available because the water isn't available. It cannot be taken out of the rivers to be used for sprinkler irrigation, except in specific reclamation areas.

Q But where it is available and usable, is that a help in combatting drought?

A Absolutely.

Q You haven't heard the testimony in here as far as the future sprinkler irrigation is concerned?

A No, I have not.

Q What about crop rotation; is that a help?

A Well, it's not a help because what good does it do to rotate crops if all crops, any crop, goes back to the extremity of the drouth. It isn't going to cure -- crop rotation is not a solution to drouth.

Q Well, here again we're speculating that we are going to encounter a drouth; isn't that right?

A Yes, we are not prophets, Mr. Bellingham. I wish that we were.

Q And I'm sure you wouldn't want to have us believe, by inference or otherwise, that your prophecy is absolutely correct?

A There is no such thing as being absolutely correct, to my knowledge; even among lawyers.

Q Are you sure of that?

A Two plus two equals four, but I've got a 9-year old son who controverts that very nicely. I'm saying there are no absolutes, Mr. Bellingham.

Q Being in your household, I would think perhaps you deserve that.

MR. BELLINGHAM: No further questions.

HEARINGS EXAMINER: Mr. Graybill.

Redirect, by Northern Plains Resource Council

By Mr. Graybill:

Q Mr. Toole, I don't want to spend a lot of time because it's late, but I have two or three things that I want to ask you about. The first is, Applicants' Exhibit 165, I don't know if you still have it before you. That's the yellow book.

A Yes, sir.

Q Now, Mr. Bellingham had you turn to page 12 in that book.

A Yes, sir.

Q And he had you also read the average figure for acre feet flow of 8.8 million cubic feet. Now as I read your text, and he was referring to your text, it seemed to me you were saying you didn't like to depend on an average because you couldn't grow grass on an average.

A That's correct, sir.

Q Isn't that the idea?

A That's correct, sir.

Q Now, Mr. Bellingham did not allow you to point out for the record the maximum and the minimum stream flow shown at Sidney, which is shown on that chart on page 13. Would you read into the record those two figures?

A Locate me now; I'm on page 13; I go to the Yellowstone Basin at Sidney. Yes, alright.

Q What's the maximum flow at Sidney?

A The maximum flow is 12,690,000 acre feet per year.

Q And what's the minimum or critical year?

A The minimum or critical year flow in acre feet per year is 3,720,000.

Q Alright, now, that's at least a 3 to 1 ratio, or about a 3 to 1 ratio?

A Roughly, yes, sir.

Q Doesn't that demonstrate your point that there is no such thing as an average on this river?

A It illustrates it beautifully. The reason I did not bring that up earlier is that when you're suddenly confronted with a document with data in fine print, you don't think that fast.

Q Well, in any event --

A If you look at it, of course that's what I'm talking about. Look at the extremity, maximum to critical; and now look over here under the average; and that's what I'm talking about, averages don't work.

Q Alright, now, another point that I'd like to bring out, Mr. Bellingham had you read that paragraph on the bottom of page 12, but you didn't quite finish the paragraph there, as is constantly his practice.

MR. BELLINGHAM: I move that that be stricken. As I recall, I read the entire paragraph, Mr. Graybill.

HEARINGS EXAMINER: It's stricken.

Q You didn't read carefully enough or with the right emphasis the last clause, and it says there that the quantities represented on this chart that it's coming to, represent essentially the remaining water supplies after 1970. Do you see those words, "after 1970"?

A Well, I had missed them.

Q Which can be considered for development, meeting the needs in the future. Now can you think of anything that's happened between the time of your chart, proposed Exhibit 16, was made in 1970, that might change the river flow?

A Well, yes, of course I can. I hope we're not going to get into averages; but, of course, you change the river flow whenever you impound water and every time you build a dam and every time you have a reservoir you change and regulate water flow. But you don't change the total of the water flow at all.

Q But the fact of the matter is, the reason the text uses the words "after 1970," is because by that time we had a major dam known as the Yellowtail Dam on the riverflow, didn't we?

A Yes, sir.

Q Plus other reservoirs of one kind or another?

A Yes, sir, plus one proposed of brosticnagion proportions.

Q So, in other words, the 8.8 million foot average that Mr. Bellingham points out that this text, Exhibit 165, refers to; the average is based upon the fact that they now have dams upon the river that can control it; isn't that so?

A Yes, sir.

Q So, in other words, your point is that an average is a poor thing to grow grass by because it isn't always the right rainfall; isn't that the idea?

A Mr. Graybill, I've been trying to say that all afternoon; I've said it 8 times.

HEARINGS EXAMINER: Doctor Toole, do you want to object to that question as being repetitious?

WITNESS: Yes, sir. I didn't know witnesses could object.

Q Mr. Toole, do you believe that eastern Montana can sustain its ecology and its culture if eastern Montana is opened up to power development industrialization by the approval of 3 and 4?

A No, sir.

Q In other words, and I think this strikes at the heart of Mr. Bellingham's question about whether it's just 3 and 4 or the rest of them; the point seems to be, then, isn't it, that opening up the area by enlarging the power industrialization involved in 3 and 4, will really, in effect, make it impossible for the area to maintain its ecology and its culture in the long run; isn't that your opinion at this time?

A It is, sir. I see no way around it at all.

Q Alright, now, have you got your little chart that you got from Mr. Lammison before you?

A Yes.

Q I wonder if you would take your pencil and mark the years 1927, '28, '29 and '30 in the third quadrant there so that you can find them readily?

A '27 -- I have to do this without -- '28, yes, alright, sir.

Q Now Mr. Bellingham has introduced a whole sheet of meteorological reports from eastern Montana, the fine print of which, of course, is impossible to scan all at once. But, while you've been talking, I have taken Exhibit No. 241, entitled "Climatic Summary of the United States," and I've turned where Mr. Bellingham has pointed out to us in that chart under "C" and found Colstrip in Rosebud County. And surprisingly enough, that particular exhibit only contained four years of figures for Colstrip. But in the four years, I averaged the April, May, June, July and August months, which you have described as the months used in your exhibit. Now, I find that the average of those 4 years turns out to be 8.52. I think you'll note that the chart cuts the year 1927 when it's above the average line and the years '28, '29 and '30, when they're below the average line; isn't that right?

A That's correct, sir.

Q So at least if we were to depend on averages, 8.52 is not too far out of range for your chart, is it?

A No, sir.

Q But then, in order to illustrate the accuracy of your chart to myself, I have further added up the figures by years, provided by Mr. Bellingham's Exhibit 241, and I find that the year 1927, the total inches of rainfall at Colstrip in those four months -- five months -- was 14.07. How does that square with your chart?

A Very accurately.

Q In other words, that's the one year of those four years that' well above the median line?

A That is correct, sir.

Q And then the next year, 1928, the 4 or 5 months added up to 8.08; how does that square with your chart?

A Very accurately.

Q And then the third year, 1929, the five summer months added up to 5.28; how does that square with the chart?

A Very well.

Q And then the last year that this particular Exhibit 241 shows, 1930, the 5 summer months added up to 6.63 inches of rainfall; how does that square with the chart?

A It does, sir.

Q So, surprisingly enough, Mr. Bellingham has been able to find some empirical evidence for you that sustains your chart, Mr. Toole, and I thought you'd be pleased to know that.

A I want to thank Mr. Bellingham very kindly.

MR. BELLINGHAM: You're quite welcome.

MR. GRAYBILL: I think I'll rest, Mr. Bellingham, and you may go on if you want to.

HEARINGS EXAMINER: Do you have re-cross, Mr. Bellingham?

MR. BELLINGHAM: No, sir.

HEARINGS EXAMINER: Very well. Doctor Toole, thank you for your appearance. You're excused and we'll now call Mr. Lamson, a public witness.

(WITNESS EXCUSED.)

JOE LAMSON, appearing as a public witness, having been first duly sworn upon his oath, both as to his written direct testimony and as to the oral testimony to follow, was examined and testified as follows:

(THE WRITTEN DIRECT TESTIMONY OF MR. JOE LAMSON WAS DIRECTED TO BE INSERTED AT THIS POINT.)

The Northern Rockies Action Group Inc.
Number Nine Placer Street
Helena, Montana 59601
(406) 442-6615

STATEMENT TO THE BOARD OF NATURAL RESOURCES AND CONSERVATION CONCERNING THE PROPOSED GENERATING PLANTS, COLSTRIP 3 & 4

Joe Lamson
Helena, Montana
March 9, 1976

My name is Joe Lamson and I am representing the position of the Northern Rockies Action Group regarding the proposed construction of Colstrip Units 3 & 4. The Northern Rockies Action Group has been incorporated in the state of Montana since 1973. Over the past few years, we have worked closely with several groups on the Northern Cheyenne Reservation. This contact with the Northern Cheyennes has made us particularly concerned about the threat Colstrip Units 3 & 4 would pose to the reservation.

I am not here to speak for the Tribe. They have done this eloquently for themselves on many occasions and during this hearing. Our testimony relates mainly to the impact the proposed power plants can have on the people, culture and renewable resource base of the Northern Cheyenne Reservation.

The Northern Cheyennes in the past few years have been vitally concerned with energy development in Southeastern Montana. It is clear that the impacts of coal development do not respect reservation boundaries. Colstrip 3 & 4 will set a disastrous precedent for the promotion of industrialization if they are approved. The type of industrialization which would seriously threaten the Cheyennes.

Northern Cheyenne witnesses to this hearing have pointed out that many of the existing poor economic and social conditions of the reservation would be worsened by the construction of Units 3 & 4. This point is crucial when considering the impact of the proposed plants. The Cheyennes have made significant progress in solving their problems. Large scale energy development such as the type proposed at Colstrip can seriously hamper their efforts to determine their own future.

Timber Resources

The 1974 Annual Report of the Northern Cheyenne Research Project estimates there are 71,000 acres of commercial timber on the reservation. It further states, that if properly managed, it can yield between three and five million board feet of lumber a year on a sustainable basis. Keith Beartusk, Tribal Forestor, stated in his earlier testimony that nearly 100 are employeed in this renewable resource industry.

If Colstrip 3 & 4 are approved, they will be adding to emissions of then existing Units 1 & 2. This poses a serious threat to the timber resource. The DNR Impact Statement notes the high susceptibility of Ponderosa Pine to sulphur dioxide emissions. Ponderosa pine is the species which makes up the bulk of the Cheyenne timber holding.

It takes 150 years for these trees to reach marketable size. If this time spand is lengthened due to air pollution, it could decrease the value of the Tribe's resource. The Cheyennes would in effect be paying an unnecessary cost to put electricity in the Northwest. A cost they would in all likelihood not be reimbursed for.

Agriculture

The Tongue River and Rosebud River Valleys on the reservation have thousands of potentially irrigable acres. The Northern Cheyenne Landowners Association is actively developing this agricultural potential. This summer land will be cleared for an irrigated grain farm. This project is to be a prototype for agricultural development on the reservation. There is some evidence that grains may be harmed by air pollution. This would limit the eventual productivity of Cheyenne grain growing enterprises.

Data on the possible effects that emissions have on native grasses is just starting to be gathered. The reservation livestock industry depends on the productivity of these grasses for its survival.

If properly developed in a clean environment, agriculture will continue to play an important role in the Cheyenne's culture and economy. At the very least the impact of Units 1 & 2 should be thoroughly assessed before the construction of Units 3 & 4 can be rationally considered. The impacts are not known for certain. Montana Power and the other applicants should not be permitted to gamble with the agricultural economy of the Cheyennes and their off-reservation neighbors.

Health

Air pollution won't only be affecting the plants. It can harm the Tribe's most valuable resource, its people. The effects of power plant emissions have already been documented in the Southwest. The Four Corners Power Complex is suppose to operate within Federal air pollution standards, yet these have not been adequate to protect the health of local residents.

Dr. Richard Geer at the Durango, Colorado Hospital has completed a ten year study which shows a doubling of respiratory disease rates after the power plants went on line. The tragic thing is that children seem to be especially prone to these diseases. The Cheyennes are already suffering an abnormally high respiratory disease rate. This evidence suggests that this problem will be aggravated by the construction of Units 3&4. The increased costs to human health seem to be left out in the cost/benefit analysis of the proposed power plants. Their ommission places a low value on human life.

In this discussion, I have mainly dwelt on the impacts caused by air pollution. Any change in the Cheyenne's environment will change their culture for better or worse. That is because it is a culture who's strength is intimately tied to the health of their people and land base. It is because of the Cheyenne's fierce pride in themselves and their land that they exist in Montana today. Colstrip 3 & 4 threaten that existence.

All the people of Southeastern Montana will suffer if that region is turned into the "nation's boiler room". The costs are too high and the benefits too short term to justify this type of development. It is for these reasons that we support the Northern Cheyennes, the Northern Plains Resource Council and Department of Natural Resources and Conservation in their opposition to the construction of Colstrip Units 3 & 4.

Thank you.

HEARINGS EXAMINER: You appear as an opponent, so Mr. Bellingham, you can look your notes over and cross-examine when ready.

EXAMINATION OF JOE LAMSON

Cross, by Applicants

By Mr. Bellingham:

Q How old are you, sir?

A Twenty-six.

Q What is your occupation?

A I work as a communications specialist for the Northern Rockies Action Group.

Q Is that your sole job?

A Yes.

MR. GRAYBILL: Mr. Bellingham, I wonder if you would allow me to interrupt. Mr. Hearings Examiner, are we going to allow 16 in the record, just so it's clear?

HEARINGS EXAMINER: Do you have any objection to 16?

MR. BELLINGHAM: No.

HEARINGS EXAMINER: Very well. Sixteen is admitted.

MR. GRAYBILL: Thank you, sir.

Q You work for them full time?

A Yes, I do.

Q And this group was set up in 1973?

A Yes, sir, it was.

Q And, what is its purpose?

A We're a public interest support team. We work in the three-state region of Montana, Wyoming and Idaho; and we provide the citizens groups and Indian groups skills and communications, community organizing, fund raising, and organizational development upon their request, to make them more effective in getting their voice into the decision making process.

Q Who funds the group?

A We get various sources of funding; most of it comes from foundation sources. We do do some consulting work for pay with various state agencies. Some citizen groups occasionally reimburse expenses. The bulk of it, though, is from foundations.

Q How many people are employed there?

A Presently nine people are employed; six of those full time, and three part time.

Q You're one of the six full time?

A Yes, I am.

Q Do you head the group?

A No, Mr. Bill Bryan heads the group, he is the action coordinator.

Q Who is the president?

A The president of the board of directors is currently John Rouch of Arlington -- no, excuse me, he is not currently the one. We're in a transition stage right now between -- the board is supposed to be selecting a new chairperson right now from the various board of directors.

Q Who was the previous?

A John Rouch was, of Arlington, Virginia. He also owns property in Montana and has been active in a lot of the groups out here.

Q You talk in your statement, and I want to shorten this interrogation down, about what would happen if 3 and 4 came on; it would seriously threaten the Cheyennes; do you recall making that statement?

A Yes, I do.

Q And this is speculation on your part, is it not?

A Well, it's speculation based on a wide variety of sources, listening to testimony here at these hearings, reading the DNR report, various other reports; and it looks like it is a very educated guess, to me.

Q And how have you read the transcripts of this proceeding?

A I haven't read transcripts, but I've been in and out of the hearings off and on. And especially on the air pollution, I've heard the testimony of your witness from Sierra Madre, California, Doctor Hall, or something like that; and I've heard Doctor Gorden's testimony also.

Q How much time have you spent here?

A In the total hearings? I believe I was here for 1 to 2 days with Doctor Hall and then I heard Clancy's testimony here, though I've spent time talking with Clancy about this issue.

Q You also talk about the possibility of timber resources being hurt by 3 and 4; and this is based on the same information?

A A great deal of it comes from the DNR's Impact Statement. It seems very clear that they listed Ponderosa pine as an indicator species, and that's the main timber resource of the Cheyennes.

Q But it is not based it upon the evidence in this case, apparently, as far as that particular item is concerned; that is, timber resources?

A Pardon, I don't understand your question.

Q Not based on the evidence produced in this case; you're talking about the DNR Impact Statement?

A Yes, I do. And I also listened to Clancy's testimony this morning.

Q Other than the things you mentioned that you have, there is no other source?

A I believe the DNR study listed quite a few studies that backed up that particular conclusion.

Q But you didn't read those particular studies?

A I've read the summaries in the DNR study.

Q The same is true of agriculture?

A Some from the DNR studies; some from Doctor Gorden's testimony here; some from in my college training, we read different texts on that particular subject.

Q How long ago was that?

A I received my Bachelor of Arts degree in environmental studies in 1972, and a Master of Science in natural resources in '74.

Q Now, you state that the Cheyennes have made significant progress in solving their problems; what do you mean by that?

A I think if you can look at the document that was put out by the Montana State Department of Indian Affairs, where they do a lot of demographic and economic data of the different reservations in Montana, you can look at the Cheyenne, in a lot of areas, certainly they're not up there with the non-Indian population; relative to a lot of reservations, they have made a lot of progress in dealing with their employment problem. Another area is the co-leases that they have declared null and void. I consider that significant progress. A few years ago they were under the threat of complete domination of their reservation by outside energy sources, and now they've at least turned it around.

Q Well, the fact that they have declared them void, and you're talking now about their coal leases, doesn't mean that they will be declared void in a court of law, does it, necessarily?

A That's a gray area that right now they're waiting on the Secretary of the Interior to provide them with the funds that he had promised to litigate those, and it has not come forth yet.

Q Do you know what the unemployment rate with the Northern Cheyenne is now?

A That's a question that's open to dispute; I've heard figures ranging from 20 to 40 percent.

Q That's exactly correct; 25 to 40 percent. Would you say that that's progress, with a possible 40 percent unemployment rate?

A I think that that is not -- you know, if non-Indian progress, it should certainly be way down. But if you look at other reservations and what the unemployment rate has been in the past few years, that is significant progress, when 60 percent has been considered a normal unemployment rate. So that's progress.

Q As far as other reservations are concerned?

A Yes, I'd say.

Q Now, you talk about respiratory diseases, and the fact that the Northern Cheyenne's are already suffering an abnormally high respiratory disease rate; do you know what's included in respiratory disease, do you not?

A Yes, everything from the common cold to asthma and tuberculosis.

Q The common cold is by far the largest percentage, is that right?

A Yes, sir, I think the common cold, with a group of people living in poverty, is a much more serious disease than it is for you or myself. I notice that every year when I'm down on the reservation, when the cold snaps hit and people begin to get cold and the elderly people catch what we would call common colds, that they quite often die. There's an increase of funerals at that time of year as the cold weather sets in.

Q Are you aware of the fact that Beaverhead County population has more deaths from respiratory diseases than the Colstrip-Forsyth area, Rosebud County?

A That's the -- Beaverhead County is the Butte area, isn't it?

Q No, sir, Dillon.

A I heard that in the earlier testimony of the Cheyenne's when you made that point.

MR. BELLINGHAM: No further questions. Thank you, sir.

HEARINGS EXAMINER: Thank you very much, Mr. Lamson.

(WITNESS EXCUSED.)

We have one other gentleman here, he's the last public witness today, Mr. Ray Gulick.

RAY GULICK, appearing as a public witness, having been first duly sworn upon his oath, was examined and testified as follows:

HEARINGS EXAMINER: Mr. Gulick, do you appear as a proponent or an opponent?

WITNESS: Proponent.

HEARINGS EXAMINER: Very well. Mr. Doney, he is a proponent, so you and Mr. Meloy may cross-examine. Go ahead, Mr. Gulick.

STATEMENT OF MR. GULICK

I am Ray Gulick, of Joplin, and that's up on the Highline, up by Havre. And I've been listening to your programs to differe arguments. And during the Legislature, I testified, and this is some of the things I had written down at that time. So it's relative to this moment. And I'm testifying for the development of these areas.

I sympathize with the ranchers and farmers that loses his farm; but if he will just take a trip around the world for a year, his land will be better than it is now. That's the law. The primary consideration should be that the Colstrip is there, ready to be exploited at reasonable costs. In 50 years it will not be needed and will probably be considered a useless waste. Ecological considerations are minimal, considering the vast potential of unlimited electrical power. And once established, the steam generating plants can be converted to atomic power at a leisurely pace. Gases released from the tall chimneys can be taylored to unite with the atmosphere in the form of nucleii, which becomes droplets of rain, and thus deposited safely.

Metals, ash and dust can be scrubbed from emission chimneys and buried in the coalbeds. Several thousand jobs will be directly provided, but tens of thousands of jobs will be provided at the transmission outlets. The mandate is development, not destroy this needed facility.

Efforts to stall out energy generation for ecological reasons are postponing the time when Montana State can receive benefits both from use of the product and also from the taxes and better job situation. I believe in sparsely populated eastern Montana, the ecological problems are minimal. Nuclear plants require 5 to 10 years to build and are very expensive. The coal is easy to get and can be ready in a couple of years. Eventually, in 10 years or so, atomic plants will be everywhere and coal will be phased out. Strict conformity to ecological laws now will make no difference, and when atom power comes on line, the coal as fuel will be over.

Due to the danger if an atomic plant blew up, very rigid safety precautions are required, making it expensive at present. But fuel costs are one-fifth of that of oil and one-third of that of coal. The present lagging in development in use is burdening the state with no jobs, and the cost of welfare, unemployment instead of income. If the fuel crisis lasts another five years or so, the additional generation will be desperately needed and no ecological consideration will stop it other than a different form of using coal directly, and the only reason is that that would cost more, if some company has a corner on patents. The need is to start now and not spend all your time throwing roadblocks in front of this tremendous tax resource that might well run the state government and take the electrical crisis off the back of the nation.

New developments of transmission and power from coast to coast can be obtained at less cost than the outer space shuttle system, and it will benefit mankind for hundreds of years, or until better methods are developed. The use of refrigerated lines that can deliver electricity coast to coast at no loss or very little loss, once established, should be the goal of the next twenty years or so; and there's many other programs that are being developed that may come into use. But right now the problem is to get the generating plant ready to go.

And I want to thank all you gentlemen and I know you're all trained in this and I'm not. I'm just an old farmer, but it seems to me that things should be shaping up and getting something from the Colstrip area. And I think if there is the problem with the ranchers and the others down there, that suitable payment -- you have no idea the income that could come off this land -- millions of dollars. The whole nation will pay it, and it will come here. And, well, in a few years, why, we'll see the results. And thank you.

HEARINGS EXAMINER: Now, he gets to cross-examine, as they have been doing, on your testimony, sir. Mr. Doney.

MR. DONEY: No questions.

HEARINGS EXAMINER: Very well. Thank you very much for your testimony. Thank you, Mr. Doney. We can all go to dinner. Let's recess 'til 10:00 tomorrow morning.

(WITNESS EXCUSED.)
RECESS: 5:55 P.M.